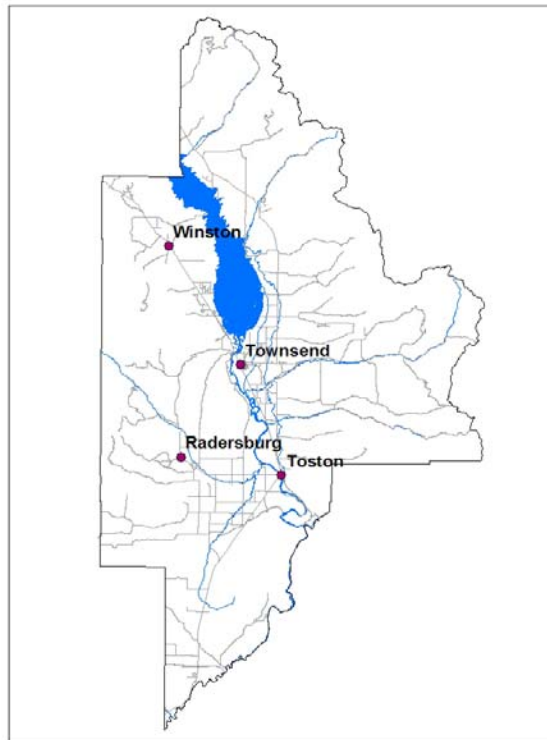


BROADWATER COUNTY, MONTANA CITY OF TOWNSEND, MONTANA

HAZARD MITIGATION PLAN

January 2004



Prepared by:



Bozeman, MT • 406-581-4512

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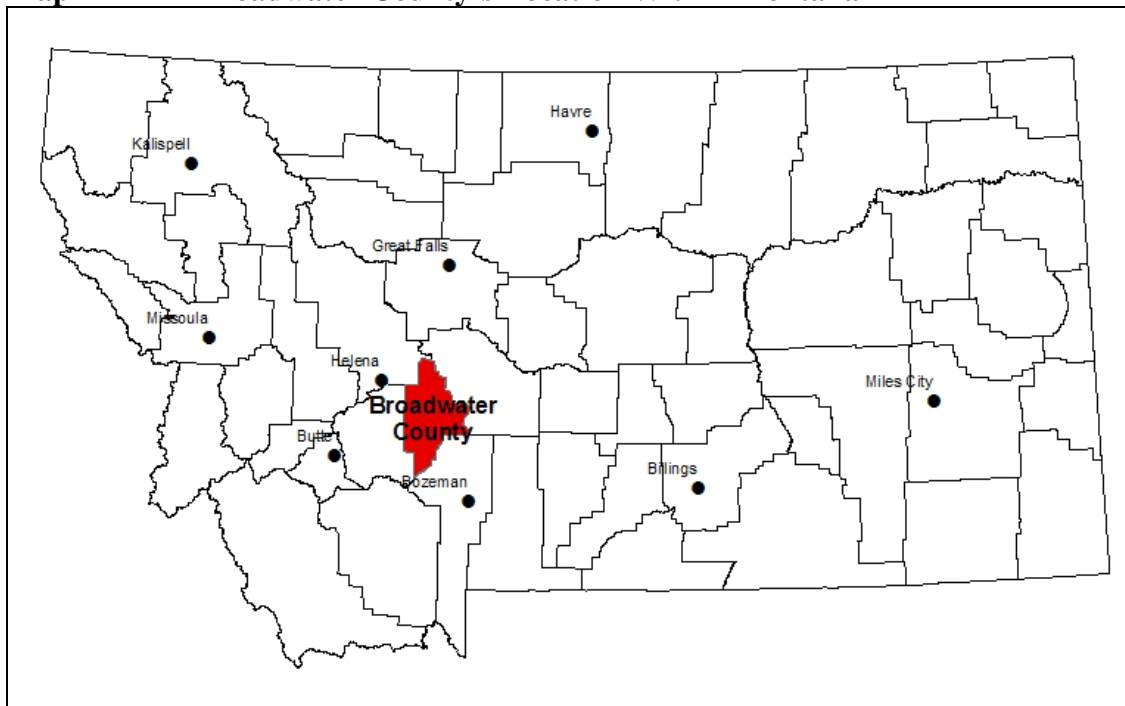
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Introduction

Broadwater County, Montana is taking the steps necessary to become a disaster resistant community, and through their initiative, received a Pre-Disaster Mitigation grant from the Federal Emergency Management Agency (FEMA) through Montana Disaster and Emergency Services (MT DES) to create a Hazard Mitigation Plan. This plan is to meet the requirements of the Interim Final Rule published in the Federal Register on February 26, 2002 at 44 CFR Part 201 as part of the Disaster Mitigation Act of 2000. The plan's intent is to assist the community in making financial decisions for mitigation projects and clarify actions that could be taken through additional funding. Hopefully through the planning process, the community has become more aware of its hazards and will continue to take a proactive approach to disaster prevention.

Broadwater County, located in West Central Montana, as shown in Map 1-1 below, is home to approximately 4,300 residents with an area of 1,193 square miles. The County is located between two mountain ranges, the Elkhorn Mountains to the west and the Big Belt Mountains to the east. Townsend, the County seat and only incorporated area within the County, is the first city along the Missouri River. Just north of Townsend, along the Missouri River system, lies Canyon Ferry Reservoir, Montana's most visited reservoir. Boating, fishing, and camping are popular activities in this area known for its natural beauty. Besides the recreational opportunities, the local economy is driven by the agricultural and mining communities.

Map 1-1 Broadwater County's Location Within Montana



HAZARD MITIGATION PLAN
Broadwater County, Montana

Resolution No. _____

WHEREAS, all citizens and property within Broadwater County are at risk from a wide range of hazards such as, but not limited to, avalanche, aviation accidents, cold temperatures, disease, drought, earthquake, flooding, hazardous materials, isolation, landslide, recreational hazards, severe thunderstorms, structure fires, terrorism, tornadoes, volcanic ash, wildfire, windstorms, and winter storms.

WHEREAS, the County, pursuant to Section 322, Mitigation Planning, of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, enacted by Section 104 of the Disaster Mitigation Act of 2000 (P.L. 106-390) and the Interim Final Rule published in the Federal Register on February 26, 2002 at 44 CFR Part 201, is required to have an approved Hazard Mitigation Plan in order to receive future federal disaster mitigation funds.

WHEREAS, a Hazard Mitigation Plan will guide the County in making decisions for pre-disaster and post-disaster mitigation projects.

NOW, THEREFORE, BE IT RESOLVED that the Board of County Commissioners of Broadwater County, Montana, hereby adopts the Hazard Mitigation Plan dated December 2003.

PASSED AND ADOPTED by the Board of County Commissioners of Broadwater County, Montana, this [*day*] day of [*month*], 2004.

James V. Hohn, Chairman

Steven McCullough, Commissioner

Elaine Mann, Commissioner

HAZARD MITIGATION PLAN
City of Townsend, Montana

Resolution No. _____

WHEREAS, all citizens and property within the City of Townsend are at risk from a wide range of hazards such as, but not limited to, aviation accidents, cold temperatures, disease, drought, earthquake, flooding, hazardous materials, isolation, recreational hazards, severe thunderstorms, structure fires, terrorism, tornadoes, volcanic ash, windstorms, and winter storms.

WHEREAS, the City, pursuant to Section 322, Mitigation Planning, of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, enacted by Section 104 of the Disaster Mitigation Act of 2000 (P.L. 106-390) and the Interim Final Rule published in the Federal Register on February 26, 2002 at 44 CFR Part 201, is required to have an approved Hazard Mitigation Plan in order to receive future federal disaster mitigation funds.

WHEREAS, a Hazard Mitigation Plan will guide the City in making decisions for pre-disaster and post-disaster mitigation projects.

NOW, THEREFORE, BE IT RESOLVED that the City Council of Townsend, Montana, hereby adopts the Hazard Mitigation Plan dated December 2003.

PASSED AND ADOPTED by the City Council of Townsend, Montana, this [*day*] day of [*month*], 2004.

Mary Alice Upton, Mayor

Planning Process

The planning process used in developing this Hazard Mitigation Plan attempted to maximize community input and utilize a wide variety of informational resources. The planning process began with an introductory meeting in March 2003 with the Local Emergency Planning Committee (LEPC). Meeting notes can be found in Appendix A. The LEPC consists of representatives from emergency management, fire services, medical services, law enforcement, planning, Red Cross, emergency sheltering, education, government administration, and the public. Both jurisdictions, Broadwater County and the City of Townsend, are represented on this committee. This already active committee was determined to be an excellent core group because of its broad representation. In addition to their roles on the LEPC, many of the members also had other duties or backgrounds that integrated well into the planning process. For example, the shelter representative is also a school teacher, a planner is also a Red Cross volunteer, volunteer firefighters are also businesses owners, the 911 coordinator is also a planner and the sanitarian, and the county commissioner is also a firefighter. These multiple roles are quite common in rural Montana and worked well in representing many interests throughout the process.

Immediately following the LEPC meetings during the months of April, May, June, and July of 2003, public meetings were held to encourage public involvement. These meetings were advertised through public notices and news articles in the local newspaper, the Townsend Star, and signs in area businesses. The Bozeman Daily Chronicle and Helena Independent Record newspapers also received the press releases. Business owners themselves were encouraged to attend through personal invitation letters from the Broadwater County Disaster and Emergency Services Coordinator. Other agencies such as the US Forest Service and the National Weather Service were also invited to provide input. Documentation of the notices and letters can be found in Appendix B.

The four public meetings were held at the Community Library in Townsend and each meeting had a particular focus. The first meeting solicited input on hazard identification. Each participant was given index cards to write hazards and historical events on and stickers to show hazard areas on a map. The second meeting focused on reviewing initial hazard profile information and gathering additional information through group discussions. The third meeting allowed participants to rank the magnitude and severity of each hazard and prioritize which hazards should be mitigated. The hazard prioritization then led into a discussion of mitigation goals. The fourth meeting then took these goals and gave the participants the opportunity to develop objectives and mitigation actions. Notes from each of these meetings can be found in Appendix A and handout materials in Appendix C.

A final public meeting was held on January 15, 2004 at 5:10PM at the Townsend Fire Station and a two week period following the meeting was provided to solicit comments on the draft plan. The meeting was advertised for several weeks in the Townsend Star newspaper. Copies of the plan were available in the Broadwater County Clerk & Recorder's Office and an electronic version was also made available on CD's. Comments received at the meeting were incorporated into the final plan document.

Comments and updates can still be made for future versions of this document. See the Plan Maintenance Procedures section for more information.

Risk Assessment

Overview:

Many hazards have been identified in Broadwater County to pose a threat to the community. The hazards were identified and profiled through several different means. A history of past events was gathered and possible future events were recognized through internet research, available GIS data, public meetings, county records, and an examination of existing plans. The public meetings included officials from federal, county, and city government departments, community volunteers, and residents on the LEPC. Input was gathered in various ways from individuals posting their concerns on note cards to general group discussions.

The hazards (in alphabetical order) have been identified as follows in Table 5-1. The level of detail for each hazard is based on the priorities established by the mitigation planning committee and is limited by the amount of data available.

Table 5-1

Hazards Identified in Broadwater County, Montana		
Hazard	How Identified	Why Identified
Avalanche	<ul style="list-style-type: none"> • State DES website • Input from planning/public meetings • Montana Hazard/Vulnerability Analysis from 1987 	<ul style="list-style-type: none"> • Mountainous terrain exists that may be prone to avalanches • Small avalanches have occurred in isolated areas
Aviation	<ul style="list-style-type: none"> • Research of the airport usage • Input from planning/public meetings • NTSB Database 	<ul style="list-style-type: none"> • Close proximity of the airports to the City of Townsend • Small incidents in the past
Disease	<ul style="list-style-type: none"> • Input from planning/public meetings • Montana Department of Livestock website • Center for Disease Control website • Academic reports • Montana Hazard/Vulnerability Analysis from 1987 	<ul style="list-style-type: none"> • History of an influenza outbreak during the 1910's • Importance of livestock health to the local economy • New emerging diseases such as SARS and West Nile Virus
Drought	<ul style="list-style-type: none"> • Input from planning/public meetings • Montana Drought Advisory Committee website • National Drought Mitigation Center website • Data from the Western Regional Climate Center • State DES website • NOAA Paleoclimatology Program website 	<ul style="list-style-type: none"> • Frequent historical drought events • Importance of agriculture to local economy • Relationship to wildfire danger

Table 5-1 (continued)

Hazards Identified in Broadwater County, Montana		
Hazard	How Identified	Why Identified
Earthquake	<ul style="list-style-type: none"> • Input from planning/public meetings • Montana Bureau of Geology and Mines publications and website • USGS National Seismic Hazard Mapping Project website • University of Utah Seismograph Stations website • USGS National Earthquake Information Center website • State DES website 	<ul style="list-style-type: none"> • Numerous faults within the county • History of nearby earthquakes greater than 6.0 magnitude • Community growth since last large earthquake • Related to potential hazardous materials incidents
Flooding – Dam Failure	<ul style="list-style-type: none"> • National Inventory of Dams website • Broadwater County DES • Dam Emergency Action Plans 	<ul style="list-style-type: none"> • Significant hazard dam within the County • DES office has plans for eight area dams, some outside of the county
Flooding – Ice Jams	<ul style="list-style-type: none"> • USACE Study • Broadwater County DES • Input from planning/public meetings • Bureau of Reclamation Report 	<ul style="list-style-type: none"> • Repetitive ice jam flooding incidents during the 1950's and 1990's • The area where the Missouri River enters Canyon Ferry Lake is prone to this type of flooding
Flooding – Riverine and Flash	<ul style="list-style-type: none"> • FEMA FHBMs and FIRMs review • Input from planning/public meetings 	<ul style="list-style-type: none"> • Several creeks and streams run through the county, including the Missouri River • The confluence of the Gallatin, Madison, and Jefferson Rivers forms the Missouri River near the southern county line
Hazardous Materials	<ul style="list-style-type: none"> • Input from planning/public meetings • Broadwater County DES 	<ul style="list-style-type: none"> • Large propane tanks sit along the railroad tracks close to the City of Townsend • Hazardous materials are frequently transported through the County
Isolation	<ul style="list-style-type: none"> • Input from planning/public meetings 	<ul style="list-style-type: none"> • Primarily two bridges serve the County into and out of the City of Townsend • Alternative routes would be significantly longer
Landslide	<ul style="list-style-type: none"> • USGS National Study 	<ul style="list-style-type: none"> • The county has an area of landslide incidences
Recreational Hazards	<ul style="list-style-type: none"> • Input from planning/public meetings • Bureau of Reclamation website 	<ul style="list-style-type: none"> • Canyon Ferry Lake serves a large recreational population • An incident could overwhelm county resources

Table 5-1 (continued)

Hazards Identified in Broadwater County, Montana		
Hazard	How Identified	Why Identified
Structure Fires	<ul style="list-style-type: none"> • Input from planning/public meetings • Broadwater County Rural Fire District's Community Fire Plan 	<ul style="list-style-type: none"> • Development is occurring in areas that do not have adequate water supplies for fire protection
Terrorism	<ul style="list-style-type: none"> • Centers for Disease Control website • Input from planning/public meetings • Broadwater County Emergency Operations Plan 	<ul style="list-style-type: none"> • Little protection of hazardous materials and critical facilities • Heightened alert since September 11, 2001
Tornadoes & Severe Thunderstorms	<ul style="list-style-type: none"> • National Climatic Data Center website • National Weather Service website • Review of ASCE Design Wind Speed Zones 	<ul style="list-style-type: none"> • The entire county is within ASCE Zone II • Severe thunderstorms and tornadoes have occurred in recent history
Volcano	<ul style="list-style-type: none"> • State DES website 	<ul style="list-style-type: none"> • Proximity to active volcanoes that could deposit ash over the County
Wildfire	<ul style="list-style-type: none"> • Input from planning/public meetings • Review of past disaster declarations • Review of archived news articles • National Weather Service website 	<ul style="list-style-type: none"> • Mountainous, forested terrain exists throughout the County • History of wildfires • Growth in the urban wildland interface
Wind	<ul style="list-style-type: none"> • National Weather Service website • National Climatic Data Center website 	<ul style="list-style-type: none"> • History of minor wind events
Winter Storms & Cold Spells	<ul style="list-style-type: none"> • Data from the Western Regional Climate Center • Input from planning/public meetings 	<ul style="list-style-type: none"> • Recent history of road closures due to winter conditions • Potential for power outages during a cold spell

Assets and Community Inventory:

An important piece of assessing the risk of the community to the identified hazards is to determine what assets may be more vulnerable to those hazards than others. Those facilities that are considered vital to the community such as law enforcement, fire services, health services, and other government services have been identified as **critical facilities**. Facilities housing particularly vulnerable populations such as nursing homes for the elderly, schools, jails, and shelters are also considered to be critical facilities. These facilities have been identified by the Disaster and Emergency Services Coordinator and additional research through the planning process. The critical facilities can be found on Map 5-1 with more detailed views on Map 5-2.

The critical facilities owned privately or by the local government are also outlined in more detail in Table 5-2 in terms of their values. The critical facilities owned by the State of Montana or the Federal government are also listed in Table 5-2 but are not addressed for specific mitigation measures.

Table 5-2

Critical Facilities				
Name	Address	Size (sq. ft.)	Replacement Value (\$)	Sources of Information
Broadwater County Courthouse	515 Broadway, Townsend	17,948	\$1,620,151	Broadwater County Insurance Appraisal Reports
Broadwater County Jail	515 Broadway, Townsend	5,325	\$2,000,000	Broadwater County Sheriff's Office
Townsend City Offices	129 S. Spruce St., Townsend	10,650	\$958,500	CAMA Data and estimate of \$90/sq. ft.
Broadwater Health Center	110 N. Oak St., Townsend	33,300	\$7,750,000	Sam Allen of Broadwater Health Center
Townsend Fire Station	130 S. Cedar St., Townsend	7,000	\$336,401	Broadwater County Insurance Appraisal Reports
Toston Fire Station	8852 Hwy 287, Toston	2,992	\$139,231	Broadwater County Insurance Appraisal Reports
Radersburg Fire Station	10 W. North St., Toston	1,600	\$54,166	Broadwater County Insurance Appraisal Reports
Duck Creek Fire Station	3066 Hwy 284, Townsend	500	\$17,579	Broadwater County Insurance Appraisal Reports
Winston Fire Station	6467 Hwy 287, Winston	1,200	\$39,162	Broadwater County Insurance Appraisal Reports
Broadwater County Search and Rescue Building	End of N. Cedar St., Townsend	240	\$44,448	Broadwater County Insurance Appraisal Reports
Water Tower	510 Broadway, Townsend	N/A	N/A	Visual observation
Broadwater County Transfer Station	370 Indian Creek Rd., Townsend	5,558	\$266,428	Broadwater County Insurance Appraisal Reports

Table 5-2 (continued)

Critical Facilities				
Name	Address	Size (sq. ft.)	Replacement Value (\$)	Sources of Information
City/County Public Works Shop	End of N. Cedar St., Townsend	5,400	\$139,207	Broadwater County Insurance Appraisal Reports
Townsend Airport	50 Airport Dr., Townsend	512 plus runways	\$1,377,741	Broadwater County Insurance Appraisal Reports
Shelter – LDS Church	916 Broadway, Townsend	5,500	\$700,000	Estimated from Jim Holland Jr., LEPC Shelter Representative
Toston Dam	515 Toston Dam Rd., Toston	N/A	N/A	State-owned dam
Montana Department of Transportation	7827 US Highway 287, Townsend	N/A	N/A	State facility
Vulnerable Populations and Other Community Facilities				
Cecelia Hazelton Elementary & Junior High School	201 N. Spruce St., Townsend	51,564	\$4,143,672	Construction Summary Report from the Townsend Public Schools' Superintendent's Office
Broadwater High School	210 N. Spruce St., Townsend	68,713	\$5,843,136	Construction Summary Report from the Townsend Public Schools' Superintendent's Office
Townsend Personal Care	128 US Highway 12E, Townsend	7,000	\$212,000	Facility Owner
State/County Public Assistance Offices	124 N. Cedar St., Townsend	2,080	\$66,000	Broadwater County Insurance Appraisal Reports
Broadwater County Museum	133 N. Walnut St., Townsend	7,200	\$462,694	Broadwater County Insurance Appraisal Reports
Senior Citizens' Center	516 2 nd St., Townsend	2,016	\$98,437	Broadwater County Insurance Appraisal Reports
Broadwater County Fairgrounds	205 US Highway 12E, Townsend	29,428 (all structures)	\$723,181 (all structures)	Broadwater County Insurance Appraisal Reports
Montana Fish, Wildlife, & Parks Office	39 Centerville Rd., Townsend	N/A	N/A	State facility
US Post Office	501 S. Front St., Townsend	N/A	N/A	Federal facility

Table 5-2 (continued)

Vulnerable Populations and Other Community Facilities				
Name	Address	Size (sq. ft.)	Replacement Value (\$)	Sources of Information
US Post Office	511 Missouri St., Toston	N/A	N/A	Federal facility
Federal Offices (USDA)	415 S. Front St., Townsend	N/A	N/A	Federal facility

In terms of infrastructure, very limited information exists outlining the specific infrastructure within the County. Electric transmission lines are operated by Northwestern Energy and telephone lines are operated by Qwest. Both are present throughout the County. Several cellular telephone towers are also present and are owned by various entities. Natural gas lines do not extend into the Townsend area and many residents use propane for heat. Public water and sewer does exist, but only for the City of Townsend. State roads are generally paved and in good condition. Most roads within the City of Townsend are also paved but are in a much poorer condition. County roads are mostly gravel in decent condition. Several bridges also exist in the County.

In addition to the critical facilities, residences, businesses, and other facilities are also vulnerable to these hazards. The population of Broadwater County is 4,385 with 2,002 housing units. The median value of those housing units is \$85,500. Also, 105 private, non-farm establishments exist. These figures were determined using 2000 US Census data. A further breakdown of the housing units can be found in Table 5-3.

Table 5-3

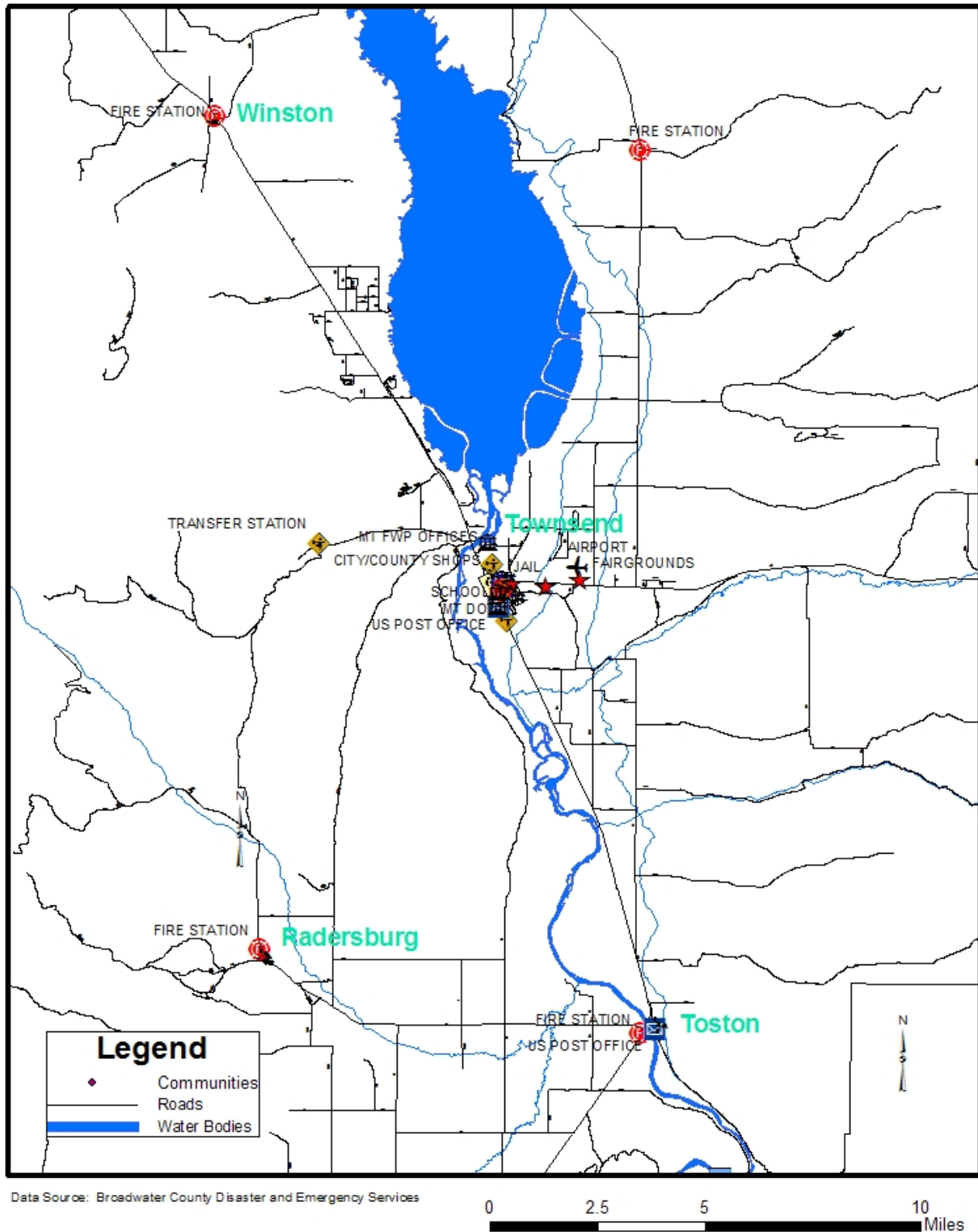
Housing Census Data from 2000	
Units in Structure	Number
1-unit, detached	1,352
1-unit, attached	14
2 units	23
3 or 4 units	69
5 to 9 units	23
10 to 19 units	23
20 or more units	2
Mobile home	456
Boat, RV, van, etc.	40
Year Structure was Built	Number
1999 to March 2000	128
1995 to 1998	148
1990 to 1994	184
1980 to 1989	268
1970 to 1979	509
1960 to 1969	103
1940 to 1959	219
1939 or earlier	443

Table 5-3 (continued)

Housing Census Data from 2000	
Value	Number
Less than \$50,000	63
\$50,000 to \$99,999	364
\$100,000 to \$149,999	165
\$150,000 to \$199,999	55
\$200,000 to \$299,999	15
\$300,000 to \$499,999	0
MEDIAN	\$85,500

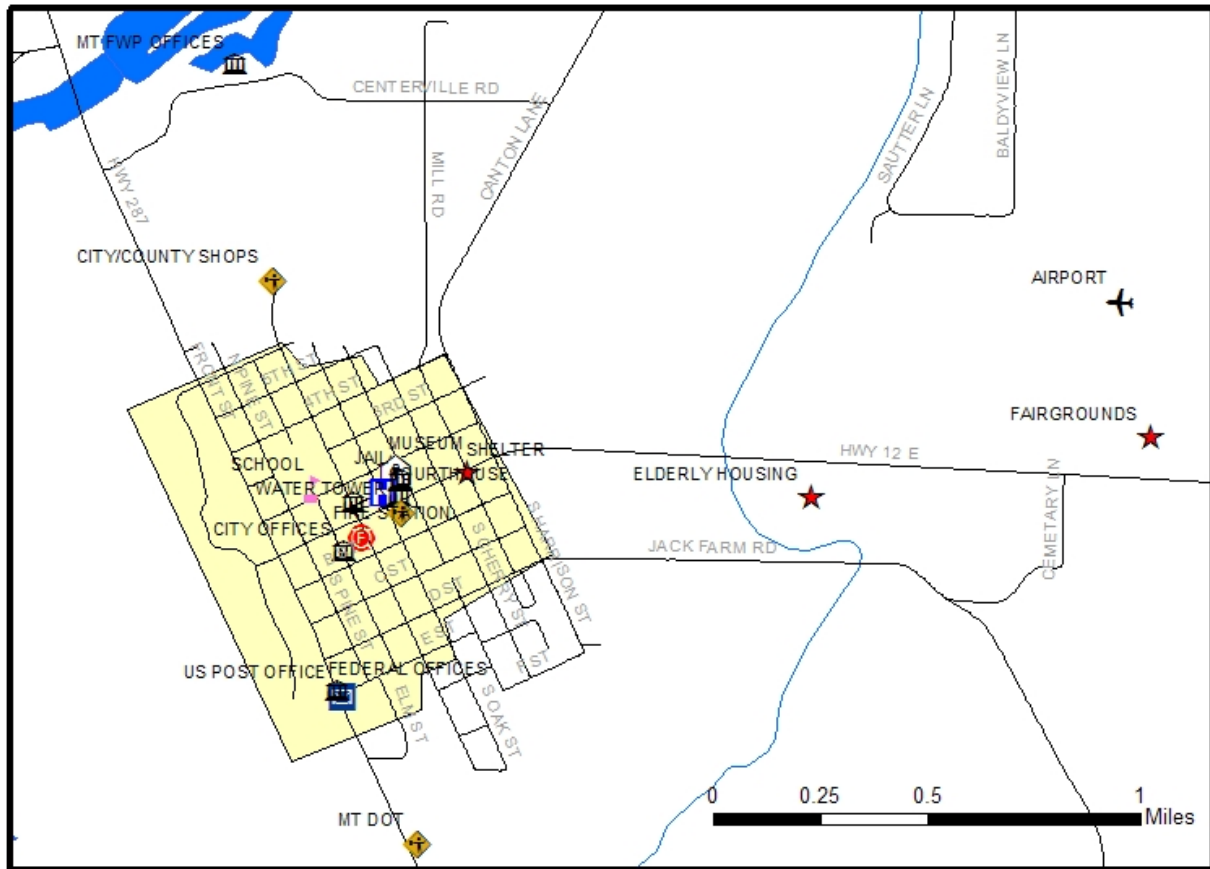
Using this census data, the total value of residential structures in Broadwater County can be estimated at \$171,171,000 (2,002 housing units * \$85,500/unit).

Critical Facilities Broadwater County, MT

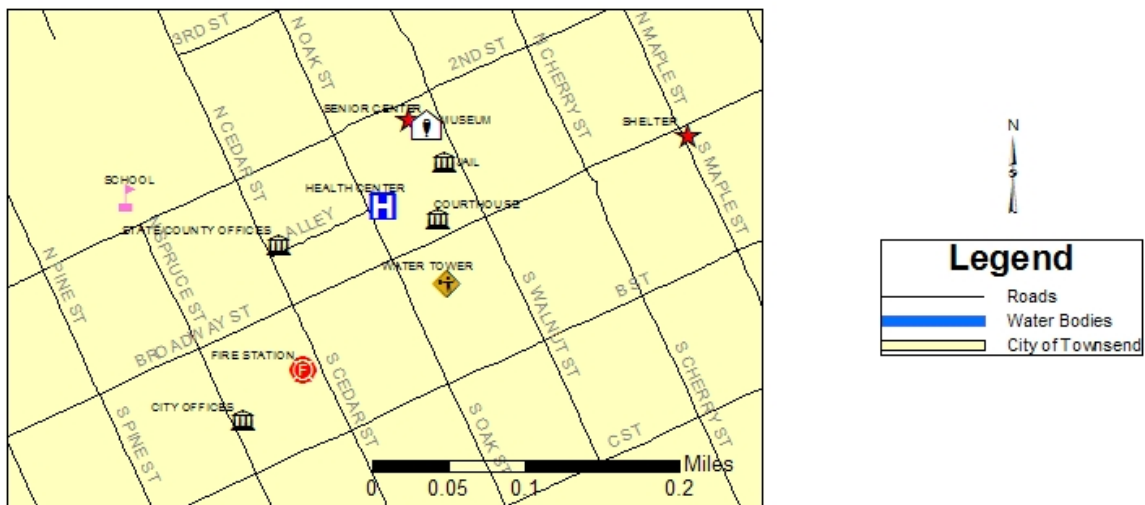


Critical Facilities Broadwater County, MT

Map 5-2



Townsend, MT



Data Source: Broadwater County Disaster and Emergency Services

Land Use and Future Development:

Broadwater County is largely a rural area with much of the land used for agricultural purposes. Exceptions include the City of Townsend, a more urban residential area, and subdivisions scattered throughout the County. Broadwater County adopted a Growth Policy Plan and Comprehensive Economic Development Strategy in May 2003. Public involvement was used extensively in the plan's development from surveys to public meetings. Much of the information for this section was derived from that plan.

From US Census data and figures presented in the Growth Policy Plan, about 65% of the land, 515,000 acres, within the County is privately owned. The remaining 35% is primarily owned by the federal government. Of the privately owned land, about 63%, or 326,000 acres, is used for grazing. Only 20,000 acres could be considered urban or used for utilities. The population of Broadwater County has been increasing steadily since 1970. Most of the development has occurred on the fringes of agricultural land.

The Broadwater County Growth Policy Plan identifies parts of the County that are desirable for future development. The County does not currently have any zoning regulations and does not have any plans to limit industrial, commercial, or residential development. The County does, however, have subdivision regulations in place. The following areas have been recommended for growth: along the Lewis and Clark County Line near Highway 287, Winston, Silos area, Northwest Townsend, Toston, and the Junction of I-90 and US 287. The survey conducted in conjunction with this plan showed many residents "strongly favor sound land use planning concepts such as: encouraging new growth near existing communities, minimizing added costs of growth to taxpayers, avoiding interference with agricultural operations or developing productive agricultural land, and discouraging development along rivers, streams, and lakes." This growth policy plan shows strong support for safe development while also ensuring the protection of private property rights.

Vulnerability Assessment Methodology

Broadwater County is currently in the process of developing an Enhanced 911 system. The development of this system involves the mapping of structures within the County. Kadrmas, Lee & Jackson, the firm hired to develop the mapping, was able to provide preliminary GIS data of structure locations, shown as points. This GIS structure data, used in the vulnerability analysis, has 2,013 structures and therefore is quite compatible with the 2000 census data for loss estimation purposes.

Structure losses have been determined using the preliminary GIS structure data and various hazard areas such as the floodplain for example. Whenever possible, the hazard area is overlaid on the structure data to determine the number of structures that lie within that hazard area. The value of those structures are then estimated using the median structure value of \$85,500 as determined by the 2000 census data multiplied by the number of structures in the hazard area. In most cases, the dollar values are multiplied by a damage factor since many events will not result in a complete loss of all structures. Frequently, only parts of the hazard area are affected or structures don't suffer a complete loss and may have only minor damage. These figures, of course, will only represent estimates but are based on current hazard data.

Critical facilities will also be analyzed individually based on the hazard information available. Whenever possible, losses were estimated based on factors listed in the FEMA *State and Local Mitigation Planning How-to Guide: Understanding Your Risks*.

The population impacts were qualitatively assessed based on the percentage of the population estimated to have residences in the hazard area and the general warning time that could be expected. The loss of life and possible injuries are difficult to determine and would be dependent on the time of day or year.

Hazards were ranked by the mitigation planning team based on the probability of a disastrous event and the potential magnitude of such an event. A survey was distributed and collected during a public meeting. A copy of the handout can be found in Appendix C. This ranking, in conjunction with the risk assessment, was used to develop mitigation goals for this plan. The survey results can also be found in Appendix C and are referenced in each of the hazard profiles.

AVALANCHE

When snow accumulations on a slope cannot be supported any longer, the snow support structure may break and fall creating an avalanche. The subsequent rush of unsupported snow can bury and move things in its path. The majority of avalanches do not cause any damage; occasionally however, people and property may fall in their paths.

Avalanches have been identified as a hazard by the State DES office. Given the terrain of Broadwater County, avalanches can occur. According to the State DES website, "If it is assumed that an accumulation of snow is possible anywhere in Montana, then we can evaluate the potential for hazard solely on the basis on terrain characteristics. The most important factor by far is terrain steepness. Wet snow avalanches can start on slopes of 20 degrees or less, but the optimum slope angle for avalanche starting zones is 25-45 degrees. Slopes steeper than 45 degrees will not normally retain enough snow to generate large avalanches, but they may produce small sluffs that trigger major avalanches on the slopes below. Therefore, all slopes of 20 degrees and greater should be considered as potential avalanche sites."

The Colorado Avalanche Information Center has compiled statistics on a statewide basis on avalanche fatalities. Montana ranks fifth in the nation with over 50 fatalities from 1950/51 to 2000/01. Looking at the activities the individuals were undertaking at the time of the avalanche, climbing, backcountry skiing, and snowmobiling rank as the top three.

A map titled Vulnerability to Avalanches in Montana published in the Montana Hazard/Vulnerability Analysis in 1984 shows the general areas within Montana that are considered vulnerable to avalanches. In Broadwater County, the map shows areas of moderate avalanche vulnerability along the northeastern and western edges of the county. A few isolated high vulnerability areas also exist near the northeastern county border. These areas generally coincide with US Forest Service lands. Map 5-3 shows the areas within Broadwater County owned by government entities.

Historically, Broadwater County has not suffered an avalanche resulting in major damages. Therefore, historical data does not exist that can be used to predict future losses. Digital mapping of this hazard has also not been developed to date. Based on input from the hazard mitigation planning committee, small avalanches have been known to occur on Baldy Peak and in Edith Basin. These areas are within the Helena National Forest boundaries, and therefore, are not a significant threat to the community.

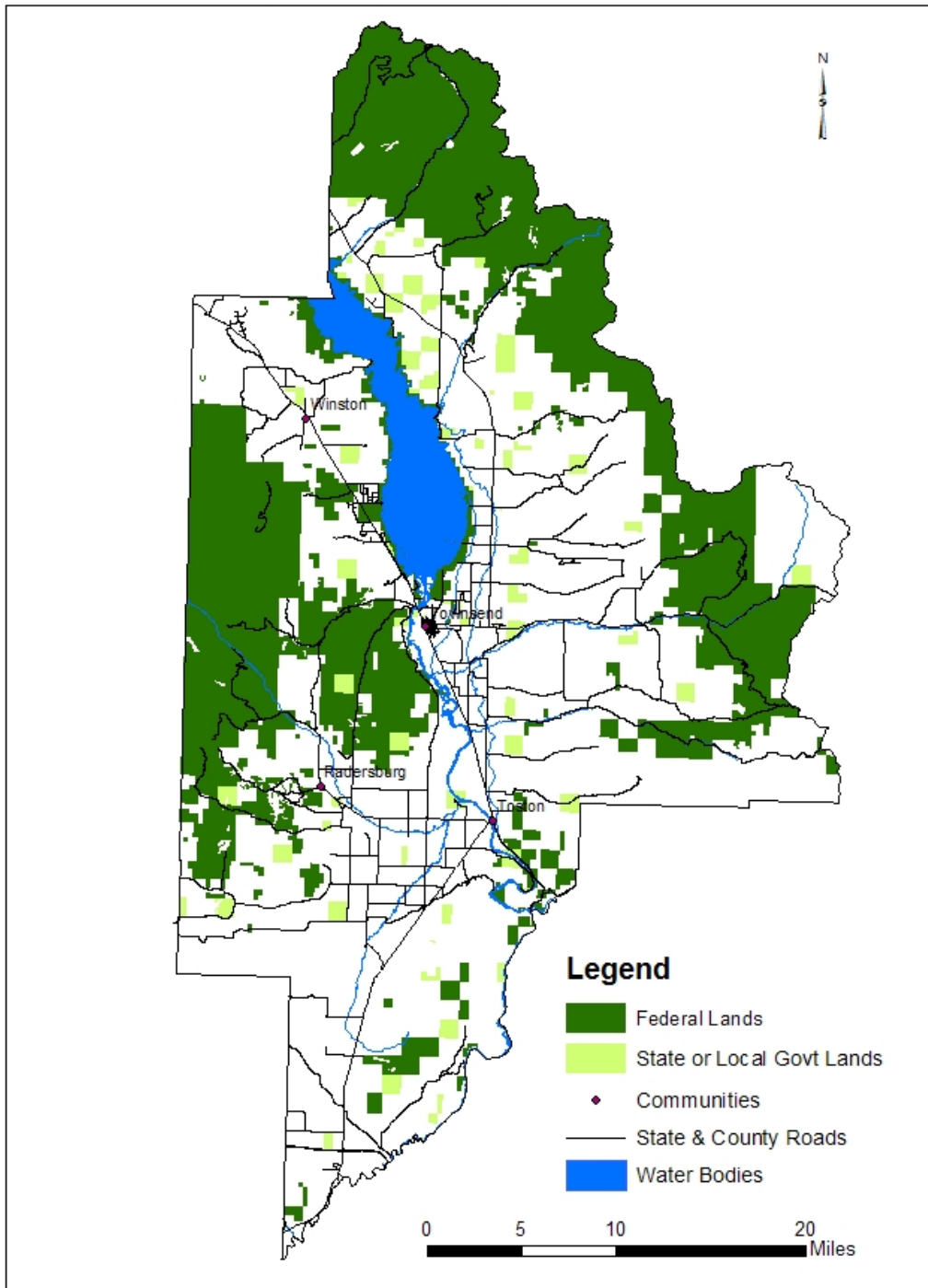
Avalanche Vulnerability

Since avalanches have not caused structural damages in Broadwater County to date and all known avalanches have occurred within National Forest boundaries, the County is assumed to have little vulnerabilities to structures. The potential exists, however, for people using the National Forests to encounter avalanches. Some probability warning capabilities exist for avalanches, however, some individuals may not receive the warnings or may choose to ignore them. Loss of life is a real possibility. An average of one fatality per year over the past 50 years has been found across the entire state, and therefore, the probability of significant loss of life in any given year in Broadwater County is extremely low.

The mitigation planning committee believes the probability of a significant event is a **low probability**. If a large avalanche were to occur the committee expects the avalanche would have a **low magnitude** or low impact on the community. Any event will most likely occur within the National Forest area. For these reasons, avalanches have been ranked #18 out of 19 hazards for mitigation.

Government Land Ownership Broadwater County, MT

Map 5-3



Data Source: Montana State Library Natural Resource Information System

AVIATION

With two small airports within Broadwater County, the potential for an aviation incident exists. The Townsend Airport, owned by Broadwater County and the City of Townsend, has a paved 4000' runway and is located about 2 miles from Townsend. With this proximity to the City, an accident could potentially occur within a populated, downtown area. This airport serves approximately 95 flights per week and the Montana National Guard frequently conducts helicopter training from this airport.

The Canyon Ferry Airport is approximately 7 miles northwest of Townsend. This airport is owned by Montana Aeronautics Division and has a 3200' gravel runway. The airport serves approximately 23 flights per week. An accident involving a larger aircraft flying over the County is also possible.

To date, no major aviation incidents have occurred in Broadwater County, however, some small aircraft incidents have happened in the past. Based on National Transportation & Safety Board (NTSB) reports, four fatalities have occurred in Broadwater County from aviation incidents since 1964 as shown in Table 5-4.

Table 5-4

NTSB Incident Report Summary for Broadwater County, Montana		
Date	Fatalities	Cause
July 17, 1993	1	Engine power lost during initial climb from improperly installed part.
June 28, 1986	1	Intoxicated pilot lost control of the aircraft.
May 14, 1974	1	Student pilot, not instrument rated, flew into adverse weather conditions.
October 28, 1964	1	Engine stall from improper operations during takeoff

None of the reports listed above mentioned any damages to structures. Two of the incidents occurred while taking off in Broadwater County, and they other two were just passing through. Based on the information above, a small aircraft fatal accident occurs approximately once every decade in Broadwater County. A small aircraft incident within Townsend city limits would probably only affect a one block area.

Aviation Vulnerability

Without any previous incidents in Broadwater County resulting in structural damages, specific structural vulnerabilities are difficult to determine. A small aircraft could potentially destroy one or two structures resulting in approximately \$100,000-\$200,000 with 1-10 casualties. A larger commercial aircraft passing over the county could certainly cause more damages to structures and result in more fatalities. A larger block area with four or five structures destroyed (approximate value of \$400,000) and 50-100 passenger fatalities could result in a large event. These figures are purely estimates based on average home values and typical airline passenger estimates to show the hazard potential. The magnitude of the event could vary from these figures greatly and would be determined by many factors including the location of impact, size of aircraft, and number of passengers. Little, if any, warning exists for aviation accidents. The critical facilities are assumed to have the same risk Countywide.

This hazard is considered a **low probability** for a disastrous event. The magnitude of such an event, if it were to occur, has been determined by the mitigation planning committee to be a **low magnitude** event. In terms of mitigation priorities, this hazard has been ranked #16.

DISEASE

Human diseases, particularly epidemics, are possible throughout the nation and Broadwater County is not immune to this hazard. In addition, since Broadwater County is an agricultural and ranching community, livestock and animal disease could have a devastating effect on the economy and food supply. Highly contagious diseases are the most threatening to both populations.

Naturally occurring diseases, some of which may not have even formed yet, could infect the population with little notice. Others, such as West Nile Virus, could become a greater problem in Broadwater County and require emergency actions at some point. Diseases that have been eliminated from the United States population, such as smallpox, that could be used in bioterrorism are discussed in the terrorism section.

The Spanish influenza outbreak after World War I in 1918-1919 caused 9.9 deaths per 1,000 population in the State of Montana according to a report titled *The Economic Effects of the 1918 Influenza Epidemic* by Elizabeth Brainerd and Mark V. Siegler in June of 2002. A similar disease event could potentially occur in the future depending on the medical services available and treatment effectiveness.

Known livestock and animal diseases such as Foot and Mouth, Bovine Spongiform Encephalopathy (BSE or Mad Cow Disease), Exotic Newcastle, Rabies, Scabies, and Brucellosis could have damaging effects on the livestock population according the Montana Department of Livestock and input from public meeting participants.

Broadwater County, given the uncertain nature of diseases, is assumed to have the same risk Countywide and is a threat to people, livestock, and wildlife.

Disease Vulnerability

Diseases threaten the population of Broadwater County as opposed to structures and property. The entire population of 4,385 is at risk for contracting disease, however, given the rural nature of Broadwater County, an outbreak may be better contained than in a more urban setting. The amount of fatalities in the County would depend on the mortality rate and the percentage of the population affected. The ability to control the spread of disease will be dependent on the contagiousness of the disease and movement of the population.

With more livestock animals in the County than people, a greater vulnerability would be a highly contagious animal disease. Based on USDA, Montana Agricultural Statistics Service Census of Agriculture data from 2000, Broadwater County had \$7,746,000 in livestock and poultry sales. Livestock and poultry inventory data from 1997 showed that the County had 30,787 animals. Losses from those animals would be devastating and have an economic effect throughout the County.

The threat of disastrous effects from a disease outbreak has been given a **low probability** with a **moderate magnitude** or impact on the community, if such an event were to occur. The mitigation planning committee also ranked this hazard as #12 for mitigation.

DROUGHT

Montana is known for its arid climate and Broadwater County is no exception. The County has been in drought for the past several years based on climate information, drought indices such as the Palmer Index, and drought monitoring at the national level. The State of Montana established a Drought Advisory Committee and developed a Drought Plan to address the hazard. Information from the National Drought Mitigation Center also identifies Montana as a drought prone state. Based on data from the Western Regional Climate Center for two stations in Broadwater County - Townsend from 1948-2002 and one mile west of Toston from 1957-1982 - temperatures can reach up to 105 degrees Fahrenheit in the summer with low humidities. Such dry, hot conditions contribute to the threat of drought conditions.

Historical information has been obtained from the State DES website and modified to reflect the conditions in Broadwater County. Known time periods of drought in Broadwater County are the 1930's, mid 1950's, 1961, 1966, 1977, 1985, and early 2000's. In the 1930's, the "Dust Bowl" drought affected the State of Montana, including Broadwater County. This nationwide drought produced erosion problems in the creation of dust storms throughout Montana. Again in the mid 1950's, Montana had a period of reduced rainfall; however, Broadwater County did not suffer as severely as those counties in the eastern and central portions of the state.

Drought struck the Broadwater County area again in 1961, and by July, the State's Crop and Livestock Reporting Service called it the worst drought since the 1930's. Better conservation practices such as strip cropping were used to lessen the impacts of the water shortages. Five years later in 1966, the entire state was experiencing yet another episode of drought. Although water shortages were not as great as in 1961, a study of ten weather recording stations across Montana showed all had recorded below normal precipitation amounts for a ten month period.

Then in the 1970's, a seven month survey ending in May of 1977 estimated that over 250,000 acres of Montana farmland had been damaged by winds. Inadequate crop cover and excessive tillage practices had resulted in exaggerated soil damage due to low soil moisture. The State of Montana began taking protective measures to conserve water.

Broadwater County was severely affected by drought again in 1985 and received a federal drought disaster declaration. For a typical 2,500 acre Montana farm/ranch, the operator lost more than \$100,000 in equity over the course of that year. The state's agriculture industry lost nearly \$3 billion in equity.

Presently, Broadwater County has had drought conditions since 2000 and has received USDA drought disaster declarations several times. Locally, the county declared a disaster on September 1, 2000 due to its inability to provide resources to feed livestock on ranches with inadequate pasture because of the two mill emergency levy already used in a wildfire disaster. The State of Montana received \$25.1 million in disaster assistance from the Farm Service Agency in 2002 alone. In May of 2003, the State of Montana was also allocated \$2.4 million from the US Department of Agriculture for water conservation and drought mitigation. This history shows that the County experiences drought almost once every decade and the drought may last for several years.

The National Oceanic and Atmospheric Administration Paleoclimatology Program has studied drought by analyzing records from tree rings, lake and dune sediments, archaeological remains, historical

documents and other environmental indicators to obtain a broader picture of the frequency of droughts in the United States. According to their research, "...paleoclimatic data suggest that droughts as severe as the 1950's drought have occurred in central North America several times a century over the past 300-400 years, and thus we should expect (and plan for) similar droughts in the future. The paleoclimatic record also indicates that droughts of a much greater duration than any in the 20th century have occurred in parts of North America as recently as 500 years ago." Based on this research, 1950's drought situation could be expected approximately once every 50 years or a 20% chance every ten years. An extreme drought, worse than the 1930's "Dust Bowl" has an approximate probability of occurring once every 500 years or a 2% chance of occurring each decade. The degree of risk can not be determined beyond the county scale. Therefore, the County is assumed to have the same risk Countywide.

Drought Vulnerability

Drought is a hazard that does not directly cause structural damage but can have significant population and economic effects. If significant enough, a drought could affect the drinking water supply for the public water system and private wells. More likely, however, a drought could have significant impacts on the agricultural community. With over \$7,000,000 in livestock and poultry sales based on data from the Montana Agricultural Statistics Service Census of Agriculture in 2001 and over 30,000 animals from 1997 estimates, significant economic losses could result from loss of pasture and food supply for those animals. These losses would be in addition to those losses associated with lower crop yields due to drought conditions. According to the Montana Agricultural Statistics Service, cash receipts from crops in Broadwater County in 2001 totaled \$9,364,000. Given that 2001 was another season of drought, losses to the economy can be significant. Compared to crop sales of over \$13,000,000 in 1996, the impact of the drought and other related factors can be recognized. Drought events evolve slowly compared to other hazards, and therefore, the direct impact to the population (i.e. loss of life, injuries) would be low.

Prioritized as the # 8 hazard for mitigation, drought is believe to have a **moderate probability** and potential **moderate magnitude** or impact on the community based on input from the mitigation planning committee.

EARTHQUAKE

Earthquakes can strike communities without warning and damage buildings and infrastructure on a large scale. Broadwater County is known to have an earthquake hazard as identified by the mitigation planning committee and through scientific research. History has also shown that Broadwater County is quite vulnerable to earthquakes. The County is located within the northern Intermountain Seismic Belt of the Rocky Mountains. Faults exist within County borders and also throughout the surrounding region. Table 5-5 lists potentially active faults within Broadwater County as published in Montana Bureau of Mines and Geology Special Publication 114 *Quaternary Faults and Seismicity in Western Montana* (Stickney, Haller, and Machette, 2000).

Table 5-5

Known Faults within Broadwater County, Montana			
Fault Name	Most Recent Earthquake	Slip Rate	Length
Canyon Ferry Fault			
North Section	<1.6 Ma	<0.2 mm/yr	18.2 km
South Section	<130 ka	<0.2 mm/yr	17.8 km
Lower Duck Creek Fault	<1.6 Ma	<0.2 mm/yr	6.8 km
Indian Creek Fault	<130 ka	<0.2 mm/yr	3.9 km
Beaver Creek Fault	<750 ka	<0.2 mm/yr	12.3 km
Spokane Hills Fault			
Range-Bounding Section	<1.6 Ma	<0.2 mm/yr	13.8 km
Piedmont Section	<130 ka	0.2-1.0 mm/yr	1.3 km
Spokane Bench Fault			
South Section	<1.6 Ma	<0.2 mm/yr	11.8 km

These faults can be found on Map 5-4. The Canyon Ferry Fault lies to the east of, and approximately parallel to Canyon Ferry Lake, extending from the Canyon Ferry Dam along the Big Belt Mountain Range to the southern third of the lake. The Lower Duck Creek Fault extends for 6.8 km from the southern edge of the Canyon Ferry Fault northwest to Lower Duck Creek Road near Canyon Ferry Lake. The Indian Creek Fault lies to the west and parallel to the southern quarter of Canyon Ferry Lake. This fault is approximately 3.9 km long and is about 5 km to the northwest of Townsend. The Beaver Creek Fault is located along the eastern edge of the Elkhorn Mountains from west of Townsend to Winston. The Spokane Hills and the Spokane Bench Faults lie in the extreme northwestern corner of the county and extend into the Helena area. Portions of the Spokane Bench Fault run along US Highway 287/12. A new fault, the Toston Fault, has recently been discovered according to the Toston Dam study in 1999 (mapping approximate). This fault extends from Highway 12 to south of Toston, approximately 4 km north of the Toston Dam.

Young fault scarps do exist along the Canyon Ferry Fault suggesting a recent surface rupturing earthquake in geological terms. The last two or three surface-rupturing earthquakes along the Canyon Ferry Fault occurred approximately between 21 ka and 13ka according to a study of the Canyon Ferry Dam by the US Bureau of Reclamation in 2003. They also suggested that the recurrence intervals could be longer than 13,000 years or as short as every few thousand years.

Faults are responsible for the structural development of prominent valleys and therefore represent important tectonic features in the region that formed by repeated major earthquakes through geologic time.

History has shown that significant earthquakes (up to magnitude 6.5) may occur anywhere throughout the Intermountain Seismic Belt, even in areas where young faults are not recognized. Examples of damaging earthquakes for which no known surface fault is recognized includes the 1935 Helena earthquakes (M 6.3-5.9).

The US Geological Survey's National Seismic Hazard Mapping Project has created peak ground acceleration maps. The maps, including the one for Broadwater County, Map 5-4, shows the strength of seismic shaking that has a 10% probability of being exceeded in a 50 year period. The strength of the shaking is measured as a percent of the acceleration of gravity (%g). Broadwater County is primarily covered by two zones. The zone in the northern half of the County represents a range of 15-20 %g in a 50 year period and the zone in the southern half of the County a range of 20-30 %g in a 50 year period. The extreme northern part of Broadwater County is in an area of less than 10%g in a 50 year period. Therefore, although the change is subtle, the southern half of Broadwater County is at greater risk from earthquake damage than the northern half, based on this data and study.

Since 1900, Broadwater County and the surrounding area have experienced fifteen earthquakes of magnitude 5.5 or greater. This history has been compiled based on data from the Montana Bureau of Mines and Geology and the University of Utah Seismograph Stations and is shown in Table 5-6.

Table 5-6

Earthquakes Magnitude 5.5 or greater near Broadwater County, Montana		
Date	Approximate Location	Magnitude
6/28/25	Clarkston	6.6
2/16/29	Lombard	5.6
10/12/35	Helena	5.9
10/19/35	Helena	6.3
10/31/35	Helena	6.0
11/23/47	Virginia City	6.1
8/18/59	Hebgen Lake	7.5
8/18/59	Hebgen Lake	6.5
8/18/59	Hebgen Lake	6.0
8/18/59	Hebgen Lake	5.6
8/18/59	Hebgen Lake	6.3
8/19/59	Hebgen Lake	6.0
10/21/64	Hebgen Lake	5.6
6/30/74	Yellowstone Park	5.9
12/8/76	Yellowstone Park	5.5

The USGS National Earthquake Information Center bases much of its analysis of earlier quakes on the Modified Mercalli Intensity rating. "The Modified Mercalli Intensity value assigned to a specific site

after an earthquake has a more meaningful measure of severity to the nonscientist than the magnitude because intensity refers to the effects actually experienced at that place.”

The following is an abbreviated description of the 12 levels of Modified Mercalli Intensity scale. (From the USGS National Earthquake Information Center website)

- I.** Not felt except by a very few under especially favorable conditions.
- II.** Felt only by a few persons at rest, especially on upper floors of buildings.
- III.** Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck.
- IV.** Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
- V.** Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
- VI.** Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
- VII.** Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
- VIII.** Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
- IX.** Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
- X.** Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.
- XI.** Few, if any (masonry) structures remain standing. Bridges destroyed. Rails bent greatly.
- XII.** Damage total. Lines of sight and level are distorted. Objects thrown into the air.

The effects and damages of some of these earthquakes in the Broadwater County area have been cataloged on the USGS National Earthquake Information Center website, abridged from *Earthquake Information Bulletin, Volume 6, Number 4, July - August, 1974*, by Carl A. von Hake.

The history of earthquakes before 1900 is incomplete due to a sparse population and very little detection instrumentation, however, three significant earthquakes are on record near Broadwater County. On May 22, 1869, an earthquake reached intensity VI at Helena. Helena was again shaken in 1872, by two earthquakes on December 10 & 11, both intensity VI.

The June 1925 earthquake near Clarkston caused violent shaking over a 1,600 square kilometer area in southwestern Montana. At that time, since the population of the region was sparse, damage was relatively light for a magnitude 6.6 earthquake. The towns of Manhattan, Logan, Three Forks, and Lombard in neighboring Gallatin County sustained the greatest damage. School buildings were damaged due to their unreinforced brick construction. Reinforced concrete, well designed masonry, and framed buildings for the most part escaped damage. This earthquake may have occurred on the Clarkston Valley Fault or the newly discovered Toston Fault. The intensity of this earthquake can be estimated at VIII north to Toston, VII near Townsend, and VI to Helena based on a study by Pardee in 1927.

A series of earthquakes in the Helena area during October and November 1935 caused four deaths, several injuries, and property damage exceeding \$4 million. The strongest shock, intensity VII, came on October 18. This tremor caused damage in varying degrees to about 300 buildings. Telephone, telegraph, and electrical services were stopped for about an hour. East of Helena, ground cracks up to 45 meters long and 1 meter deep were formed. The mainshock caused approximately \$3 million in damages in 1935 dollars. Despite the great damage from this shock, there were only two fatalities and few injuries. On October 31, another earthquake, magnitude 6 with an intensity of VIII, caused approximately \$1 million additional damage and two fatalities. A total of 1,347 shocks from this series were listed up to the end of 1935. Approximately 60% of the buildings in nearby Helena experienced structural damage.

The Hebgen Lake Earthquake in 1959 was the largest earthquake recorded in Montana's history. This earthquake was a rare surface rupturing earthquake that caused landslides, created Earthquake Lake, and made major changes in the Earth's surface. At least 28 people were killed. Many summer homes in the Hebgen Lake area were badly damaged and there was considerable cracking and shifting of roadways. State Highway 287 broke away and slid into Hebgen Lake at four different places. Damage to roads and timber was estimated at over \$11 million. A maximum intensity of X was assigned to the Hebgen Lake earthquake. Major new fault scarps formed along faults northeast of Hebgen Lake.

The Hebgen Lake Earthquake in 1959 was certainly felt in Broadwater County. However, according to an article in the Townsend Star on August 20, 1959, little damage occurred in Broadwater County – just a few jars of broken merchandise in local stores. A USGS trenching study of the Hebgen Fault in 2000 has estimated that the 1959 earthquake occurs roughly once every 3,000-5,000 years.

In addition to these larger earthquakes, smaller ones have affected the County more often. According to the Advanced National Seismic System Catalog, from 1963 to 2002, 135 earthquakes of 2.5 or greater have occurred in the immediate Broadwater County area. In addition, a strong shock of approximately 5.0 magnitude struck the Townsend Valley, northeast of Toston, in 1952 according to the Toston Dam study. A parked vehicle was moved 1 meter and minor damage such as fallen plaster in a camp house and chimney brick damage occurred.

As has already been determined in studying the earthquake hazard facing Broadwater County, surface-rupturing earthquakes are very rare but still possible. The small to moderate earthquakes, however, are more frequent and could cause major damage in the County.

If an event were to occur, the entire County could be affected, however, the southern part of the County is at a greater risk based on the PGA probabilities as shown in Map 5-4. According to the

State Hazard and Vulnerability Assessment dated 1987, the Three Forks and Helena-Ovando regions have a return time of 70 years for a magnitude 6+ event and 360-470 years for a magnitude 7+ event. The seismic study of the Toston Dam estimates through detailed methodology that an earthquake of magnitude 6.5 or greater in the region has a return period of approximately 50 years (with lower and upper bounds of 17 and 140 years, respectively).

Earthquake Vulnerability

Earthquake damages can be hard to predict and assess without detailed structure information or a damage model. Luckily, the Federal Emergency Management Agency has developed loss estimate software for earthquakes (HAZUS 99). A newer version for multiple hazards, HAZUS-MH, is currently being developed. The results from a couple of runs through the model follow.

HAZUS 99 – Canyon Ferry Fault at 6.3 magnitude (approximate 50 to 100-year event)

A scenario based on a magnitude 6.3 earthquake centered over the Canyon Ferry Fault was run using the default data in the Federal Emergency Management Agency's (FEMA) Loss Estimation Software for Earthquakes - HAZUS 99, Service Release 2. This analysis could potentially have large errors because of the inaccuracies involved with using the default data. This "first cut" estimate, though, provides some preliminary figures to use in planning before a more detailed analysis can be done.

HAZUS 99 estimates that the following number of buildings would have each level of damage:

Slight – 402 structures

Moderate – 383 structures

Extensive – 169 structures

Complete – 41 structures

Those damages to 995 buildings would equate to just under \$30 million, including contents and income losses, based on the HAZUS 99 estimates.

In terms of public infrastructure and essential facilities that are included in HAZUS 99 default data, the roadways would not be damaged. However, eight bridges within the County would be less than 75% functional with repairs totaling about \$425,000. The Broadwater Health Center and the schools were included in the default data of HAZUS 99, however, the building structure was not identified and a nationwide average was used. The schools were calculated to be 17% functional after this event. The Broadwater Health Center was assumed to have 44 beds and its functionality after the event is broken down in Table 5-6:

Table 5-6

HAZUS Estimated Broadwater Health Center Functionality after 6.3 Earthquake		
Date	Functionality	Number of Beds
Day 0 & 1	30%	13
Day 3	37%	16
Day 7	46%	20
Day 30	74%	32

The casualties estimated for this event would depend on the time of day the earthquake occurred and are broken down as follows:

2AM – 14 casualties
2PM – 34 casualties
5PM – 15 casualties

HAZUS 99 – Toston Fault at 7.0 magnitude (approximate 350 to 500-year event)

Using HAZUS 99 again, this time running an arbitrary event (7.0 magnitude on the Toston Fault), the results are as follows.

HAZUS 99 estimates that the following number of buildings would have each level of damage:

Slight – 409 structures
Moderate – 490 structures
Extensive – 272 structures
Complete – 118 structures

Those damages to 1,289 buildings would total over \$47 million in losses, including contents and income losses, based on the HAZUS 99 estimates.

In terms of public infrastructure and essential facilities that are included in HAZUS 99 default data, the roadways themselves would not be severely damaged, however, 27 of the 33 bridges in the analysis would be less than 75% functional and of those, 14 would be less than 50% functional. Bridge repairs could total over \$5 million. Using an average building type for the Broadwater Health Center and the schools, the schools were calculated to be only 5% functional after this event. The Broadwater Health Center was also severely damaged and would most likely not be in able to function according to this analysis.

The casualties from this event would depend on the time of day the earthquake occurred and would be broken down as follows:

2AM – 29 casualties
2PM – 76 casualties
5PM – 32 casualties

The results from HAZUS 99 could potentially be more accurate and informative if better data was developed and used in the analysis. Such an analysis may be considered by the County in the future and run with the new HAZUS-MH program.

The structures, particularly the critical facilities, within Broadwater County have not been seismically assessed. Some of the newer facilities such as the schools and the jail have been built to meet state building codes, however, as the 2000 census data indicates, over 63% of residences were constructed prior to 1980 and 22% of residences were constructed prior to 1940. Many of the existing homes, businesses, and critical facilities may not be structured to withstand seismic shaking.

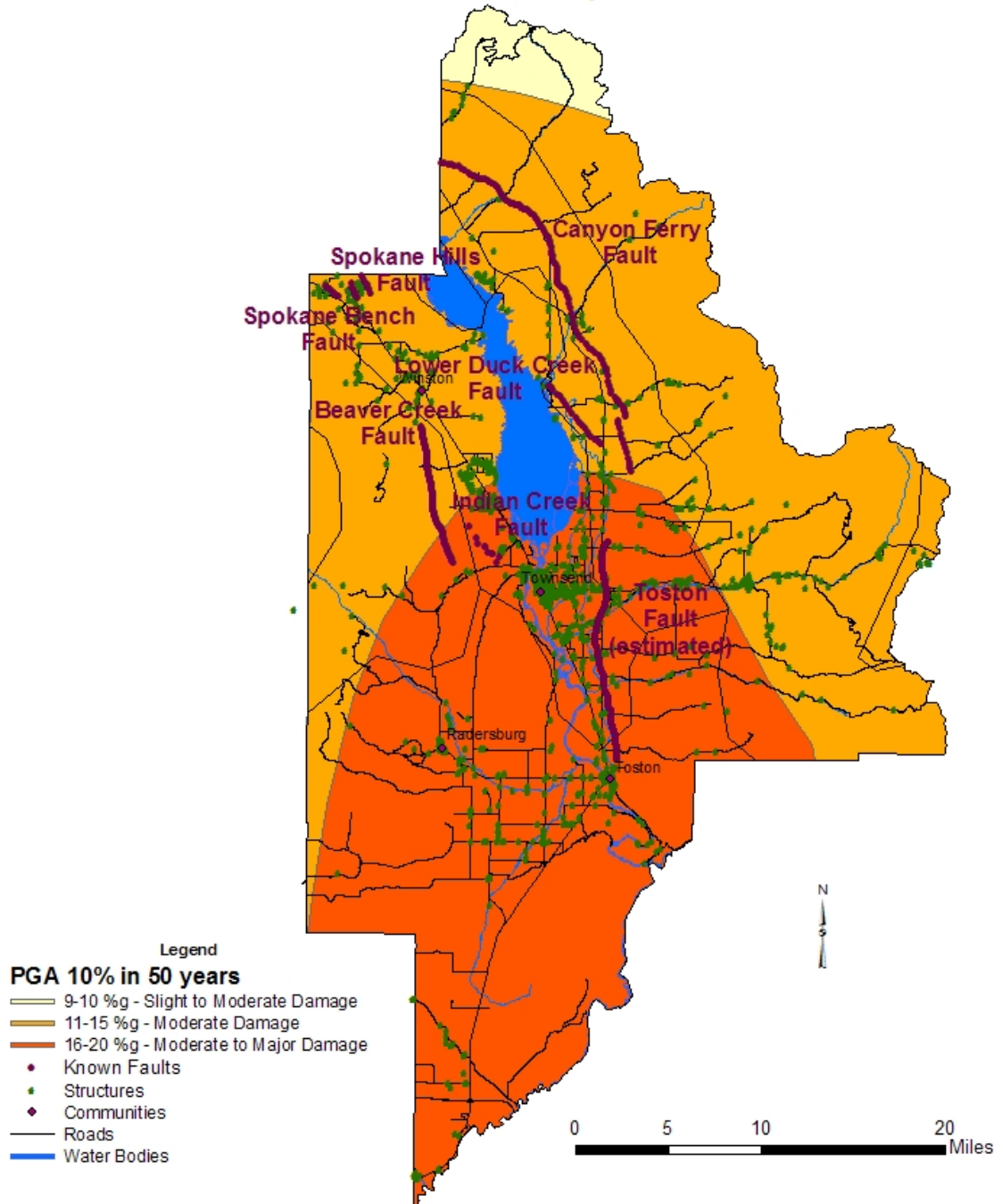
Looking at the critical facilities specifically, all, with the exception of the Winston Fire Station and the Duck Creek Fire Station, lie within the most seismic area of the County, as shown in Map 5-4. In view of this, the entire County can be considered at considerable risk for earthquakes.

A detailed seismic study has been done on the Broadwater (Toston) Dam by the URS Corporation in 1999. This study estimated the Maximum Credible Earthquake (MCE) on the Toston Fault as a magnitude 6.75. The resulting peak horizontal acceleration is estimated at 0.45 g.

The population would have little and mostly likely no warning prior to an earthquake, so the impact to that population could be considered high with little time to take protective actions.

The mitigation planning committee rated this hazard as having a **moderate probability** of occurring and the potential of having a **moderate to high magnitude** or moderate to severe impact on the community. Earthquake damages have been ranked the #3 priority for mitigation.

Peak Ground Acceleration (%g) with
10% Probability of Exceedance in 50 years
Broadwater County, MT



Data Source: US Geological Survey and Montana Bureau of Mines and Geology

FLOODING - DAM FAILURE

For varying reasons from irrigation to power generation, dams have been placed through Southwest Montana. These dams could now present a problem to those downstream if they were to fail. The National Inventory of Dams (NID) website keeps a record of dams across the country. Hazard ratings are also given to those dams for emergency management planning. Definitions, as accepted by the Interagency Committee on Dam Safety and posted on the NID website, are as follows:

Low Hazard Potential

Dams assigned the low hazard potential classification are those where failure or misoperation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.

Significant Hazard Potential

Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environment damage, disruption of lifeline facilities, or impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure.

High Hazard Potential

Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

Locations of the dams that could affect Broadwater County are shown on Map 5-5. Broadwater County has one significant hazard dam and four low hazard dams within its borders as shown in Table 5-7.

Table 5-7

Dams in Broadwater County							
Dam Name	NID ID #	River	NID Height (feet)	NID Storage (acre-feet)	Drainage Area (sq. mi.)	Hazard	Owner
Plunket Lake	MT00199	Warm Springs Creek	20	79		Low	Boyd Cazier
Potter Irrigation	MT00200	Spokane Creek	28	123		Low	Harold Myers
Duck Fields	MT03407	North Fork Duck Creek Tributary	20	82		Low	Lester Fields
Townsend Sewage Lagoon	MT01418	Missouri River Tributary	9	148		Low	City of Townsend
Broadwater (Toston) Dam	MT00016	Missouri River	50	6,460	14,669	Significant	MT DNRC

The inundation maps of a dam failure at the Broadwater (Toston) Dam can be found on Map 5-6 through Map 5-11. These maps are part of the Broadwater-Missouri (Toston) Dam Emergency Action Plan written by the Department of Natural Resources and Conservation revised in March 2003 and originally published in June 1991. A table showing the Dam-Break Analysis Results also follows in Table 5-8. More information on this dam and the analysis can be found in the Emergency Action Plan located in the Disaster & Emergency Services office.

The Broadwater County Disaster & Emergency Services office has eight dam emergency plans, including the Broadwater (Toston) Dam with the rest being for dams outside the County. Some of those dams outside the County do have inundation areas that would affect Broadwater County. The information on those dams that could significantly impact the County beyond the 100-year floodplain are listed in Table 5-9.

Table 5-9

Outside Dams that Could Affect Broadwater County							
Dam Name	NID ID #	River	NID Height (feet)	NID Storage (acre-feet)	Drainage Area (sq. mi.)	Hazard	Owner
Clark Canyon	MT00569	Beaverhead River	148	328,979	1,550	High	Bureau of Reclamation
Willow Creek Dam	MT00022	Willow Creek	105	26,600	155	High	MT DNRC
Ruby Dam	MT00004	Ruby River	111	58,400	595	High	MT DNRC

The Broadwater County inundation maps for these dams follow in Map 5-12 through Map 5-33. As the dams continue to age, they present a greater hazard without mitigation or dam repairs.

Flooding – Dam Failure Vulnerability

All of the significant to high hazard dams that could affect Broadwater County would flood along the Missouri River. All, except the Broadwater (Toston) Dam, would start flooding the southern part of the County near Three Forks and continue downstream to the north. The Broadwater (Toston) Dam, since it is located within the County, would flood from its location south of Toston north along the Missouri River to Canyon Ferry Lake.

The dams that could have the greatest impact to life and property demonstrated by their inundation maps would be the Clark Canyon Dam and the Ruby Dam, both located outside Broadwater County. These dam failures could potentially flood the entire City of Townsend, with the Ruby Dam map indicating the wave height could potentially be 27 feet as the flood passes through Townsend. The inundation maps were not provided in a digital format, however, general estimates of the number of structures that could be affected were made by comparing the inundation areas with structure data. Table 5-10 shows the number of estimated structures that could be affected by a flood from a dam break based on the estimated inundation areas during a maximum probable flood. To estimate the losses from a dam break, the average damage to the structures and critical facilities impacted was estimated to be 30% since many structures may have little damage while other may be a complete loss.

An example is the Clark Canyon Dam:

- 900 structures estimated in the flood inundation area x \$85,500 median home value obtained from census data = \$76,950,000 total estimated structure value
- In most cases, many of the structures would only have moderate, minor, or no damage, so an estimate of 30% is used as the damage factor
- \$76,950,000 total estimated structure value x 30% damage factor = \$23,085,000 estimated structure loss

Table 5-10

Estimated Losses by Dam Failure				
Dam Break	Estimated # of Structures Impacted	Estimated Dollar Losses from Structures	Estimated Critical Facilities Impacted	Estimated Dollar Losses from Critical Facilities (not including state or federal facilities)
Clark Canyon Dam	900	\$23,085,000	<ul style="list-style-type: none"> • Toston Fire Station • Toston Post Office • Townsend City Offices • Townsend Fire Station • County Courthouse • County Jail • Broadwater Health Center • Search and Rescue Building • Public Works Shop • Shelter – LDS Church • Toston Dam • MT DOT Facility • Elementary & High Schools • Public Assistance Offices • County Museum • Senior Center • MT FWP Office • Townsend Post Office • Federal Offices (USDA) 	\$7,290,563

Table 5-10 (continued)

Estimated Losses by Dam Failure				
Dam Break	Estimated # of Structures Impacted	Estimated Dollar Losses from Structures	Estimated Critical Facilities Impacted	Estimated Dollar Losses from Critical Facilities (not including state or federal facilities)
Ruby Dam	900	\$23,085,000	<ul style="list-style-type: none"> • Townsend City Offices • Townsend Fire Station • County Courthouse • County Jail • Broadwater Health Center • Search and Rescue Building • Public Works Shop • Shelter – LDS Church • Toston Dam • MT DOT Facility • Elementary & High Schools • Public Assistance Offices • County Museum • Senior Center • MT FWP Office • Townsend Post Office • Federal Offices (USDA) 	\$7,248,794
Willow Creek Dam	95	\$2,436,750	<ul style="list-style-type: none"> • Toston Fire Station • Search and Rescue Building • Public Works Shop • Toston Dam • MT FWP Office 	\$96,866
Broadwater (Toston) Dam	75	\$1,923,750	<ul style="list-style-type: none"> • Toston Fire Station • Toston Dam • MT FWP Office 	\$41,769

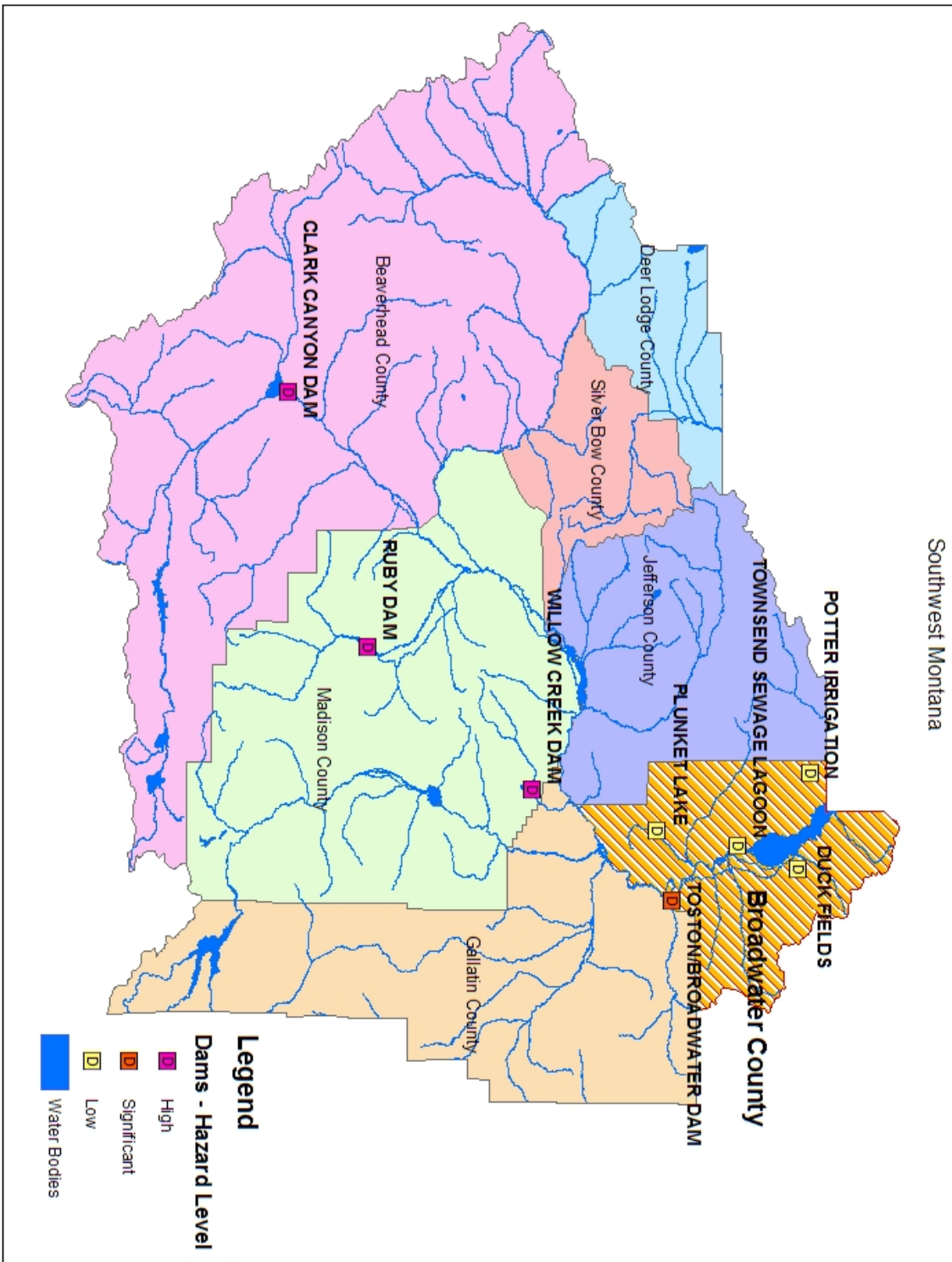
Again, these figures are purely estimates based on inundation mapping, estimated structure values, and estimated damage parameters. The losses from an actual event may vary greatly.

The dam failure events allow for some advanced warning to the public. For example, the waters from a Clark Canyon Dam break would arrive in Toston about 30 hours after the dam broke. The least amount of warning would come from a Broadwater (Toston) Dam break. The flooding in Toston could begin about an hour after the break and in Townsend at about 3 hours. Even this scenario would allow for decent warning, and therefore, the potential impact to the population is considered moderate.

The mitigation planning committee has given this hazard a **low probability** with a **moderate magnitude** if a major dam break occurred. Dam failure flooding has been given a ranking of #10 for mitigation priorities.

Dams Hazardous to Broadwater County, MT

Southwest Montana



Data Source: National Inventory of Dams

FLOODING - ICE JAMS

Ice jam flooding generally occurs in the late winter or spring when ice that has formed on a river breaks up and creates a dam along the river, thus causing it to flood. Of all of the types of flooding, ice jam flooding has been the most problematic for Broadwater County. Detailed records of ice jam flooding along the Missouri River date back to the 1950's and have continued with the last event occurring in 1997. In the 1950's, ice jam flooding was a regular event. Following an ice jam event in 1963, the Bureau of Reclamation lowered the Canyon Ferry pool earlier each fall and resolved problems until 1995. Although the problems have not occurred as frequently in recent years, the potential still certainly exists. Through public meeting comments and recent publications, the hazard can be better outlined. Specifically, the US Army Corps of Engineers (USACE) published a study in March of 2000 titled *Evaluation of Ice Jam Problems Along the Missouri River Near Townsend, Montana*. This study provides an in-depth analysis of the ice jam problem and mitigation recommendations.

In the USACE study, the FIRM maps dated December 1987 were found to be quite close to the inundation area developed by the 100-year ice jam model, except just north of the Townsend city limits. According to the study, "Based on a 20-foot contour map from the USGS, the 100-year flood boundary edge would follow the (City's) northern limits. The flood boundary edge would then turn to follow the road that leads north out Maple Street. The 100-year ice jam flood boundary edge would finally tie back with the FIRM boundary edge about 1-1/2 miles north of the (City's) north limits." Map 5-34 shows the additional areas that would be flooded in a 100-year ice jam event. The 100-year floodplain can be found in the Flooding – Riverine and Flash section on Map 5-35.

Broadwater County has quite the history of ice jam flooding. Publications used in determining the history include the USACE study already mentioned, *A History of Ice Jam Flooding on the Missouri River near Townsend: A Preliminary Review of the Historical Record* done in March of 1997 by Michael Koehnke of Broadwater County DES, and *Planning using Equations for Response – Report on Ice Gorges and Winter Flooding Near Townsend, Montana* published by the US Department of Interior, Bureau of Reclamation, Division of Irrigation in June 1958. The dates and intensity of past ice jams gathered from these publications can be categorized in Table 5-11.

Table 5-11

Ice Jam History for the Missouri River near Townsend	
Date	Intensity
1910	Unknown – Reported flooding of the grade school grounds and train depot grounds
1942	Unknown
March 25-30, 1949	Moderate
1951	Unknown
January 3-5, 1955	Moderate
February 27-28, 1955	Minor
March 4-6, 1955	Minor
March 25-30, 1955	Moderate
November 13-27, 1955	Moderate
February 13-19, 1958	Minor

Table 5-11 (continued)

Ice Jam History for the Missouri River near Townsend	
Date	Intensity
November 17-20, 1958	Minor – Flooding occurred at Green’s Meat Processing Plant, Les Goodwin’s River Inn tourist cabins, and Senator Goodwin’s motel
December 9-15, 1958	Minor
November 11-25, 1959	Major – An Army helicopter was used to lift hay to 150 head of cattle stranded by flood. The Etzwiler residence, southwest of Townsend, reported 1 ft of ice inside. Fifteen head of cattle were lost. Estimated damages from newspaper reports were \$57,224, including damages to the County rest home. This event resulted in the federal government being sued for \$8,463. Many residents believed that ice jam problems were created by Canyon Ferry Lake, a government-created reservoir.
February 3-10, 1963	Major – According to the Townsend Star on 2/7/1963, “large number of homes and business establishments have suffered severe damage.” The Montana Ditch was reported to be flooding the southeast section of Townsend including the River Inn Motel, River Inn, Green’s Processing Plant, and the County rest home where 16 residents were evacuated.
November 30-December 13, 1995	Moderate – The City sewer lagoon was isolated by flooding and several residences were evacuated.
November 17-27, 1996	Moderate – Eight animals were stranded and a MT National Guard vehicle became stuck while attempting to rescue them.
January 2-4, 1997	Major – The City of Townsend and Broadwater County declared states of emergency on 1/3/1997. A snowstorm on 12/25/1996 and subsequent thaw on 1/1/1997 created the ice jam. Townsend Storage and the A&W Restaurant were both flooded. Damages were estimated at \$19,000. Water ran over the railroad tracks and the City sewer lagoon became isolated. The MT National Guard was called in to rescue a Montana Rail Link contractor who was removing the road to the lagoon in an effort to mitigate the flooding.

The February 3-10, 1963 event was probably the most significant of the past fifty years and could be considered a 200-year ice jam flood event according to the USACE. Their study has outlined frequencies based on the Toston gauge discharge and is shown in Table 5-12.

Table 5-12

Ice Jam Flood Frequency for Missouri River (Discharge at Toston)		
Discharge	Event Frequency	Probability/Year
11,600 cfs	500 years	0.2%
9,700 cfs	100 years	1%
8,940 cfs	50 years	2%
7,210 cfs	10 years	10%
6,440 cfs	5 years	20%
5,270 cfs	2 years	50%

Flooding – Ice Jam Vulnerability

The vulnerabilities from ice jam flooding are very similar to those associated with traditional riverine flooding, with the exception of areas north of Townsend as shown in Map 5-34. The history of ice jam flooding in Broadwater County, however, is much more pronounced.

In the Townsend area, approximately 31 structures are estimated to be in the 100-year floodplain based on FEMA's Q3 floodplain data. This analysis includes the Montana Fish, Wildlife, and Parks facility. Looking at the areas where the USACE determined 100-year ice jam flooding area deviates from the FEMA floodplain, approximately 22 additional structures are added to the hazard area.

With a total of approximately 53 structures in the 100-year hazard area from ice jamming, damages could be estimated at \$1,359,450 (53 structures x \$85,500/average structure x 30% damage factor). Additionally, the City and County Public Works Facility and the Search and Rescue Storage Building critical facilities are in the 100-year ice jam hazard area. These facilities could be estimated to have \$55,097 in damages (\$183,655 value x 30% damage).

The population impacts are considered moderate because some advanced warning of flooding is possible. Based on the history involving rescues of people and animals, the entire population has not historically heeded or received warnings.

Due to the history of ice jamming in Broadwater County and the continued potential, the mitigation planning committee believes ice jams have a **moderate probability** of occurring. The impact on the community could also be of **moderate magnitude** or severity. Ice jam flooding has been ranked as the #5 priority for mitigation.

FLOODING – RIVERINE and FLASH

With the Missouri River, Jefferson River, and several other creeks and streams within Broadwater County, the potential does exist for riverine flooding. In addition, the mountainous terrain and frequent wildfire burn areas increase the potential for flash flooding. The Federal Emergency Management Agency has identified a flood hazard in Broadwater County through its National Flood Insurance Program. A Flood Insurance Study has not been produced for the County, however, the unincorporated areas of Broadwater County have a Flood Hazard Boundary Map (FHBM) dated February 9, 1982 with a conversion letter dated December 1986. The City of Townsend has a Flood Insurance Rate Map dated September 29, 1986. A floodplain management resolution was passed by the Broadwater County Commissioners on June 2, 1981. A map of the 100-year floodplain within Broadwater County using FEMA's Q3 GIS mapping data is shown in Map 5-35.

Although in recent history riverine and flash flooding have not been a problem for Broadwater County, the small streams and ditches have overflowed leading to road closures and washouts. Based on data from the Western Regional Climate Center for two stations in Broadwater County - Townsend from 1948-2002 and one mile west of Toston from 1957-1982 - the area can receive up to two inches of rain in 24 hours.

Broadwater County has received Presidential Disaster Declarations for flooding in 1975 & 1981. Little information on the events exists in County records but most of central and southwest Montana is thought to have been affected. According to the State Hazard and Vulnerability Analysis from 1987, the Jefferson River near Three Forks flooded in 1899, 1908, 1927, and 1948.

In the USACE ice jam study, the discharge at the Toston gauge for regular flooding events was identified and is listed in Table 5-13.

Table 5-13

Riverine Flood Frequency for Missouri River (Discharge at Toston)		
Discharge	Event Frequency	Probability/Year
48,800 cfs	500 years	0.2%
41,000 cfs	100 years	1%
37,500 cfs	50 years	2%
28,900 cfs	10 years	10%
24,700 cfs	5 years	20%
18,000 cfs	2 years	50%

Hazard data regarding the potential for flash flooding of some of the smaller creeks and streams does not exist, however, that type of flooding is certainly possible. In recent history, based on input from the public meeting attendees, flooding from rapid snowmelt caused 2-5 inches of water to run across US 12 between mile posts 69.5 and 71.1 on March 13, 2003. Rapid snowmelt and heavy rain can both lead to flooding problems. In addition, wildfire burn areas can contribute to rapid runoff from rain or snowmelt. Broadwater County does have large areas of burnt forest that may now be more prone to flash flooding. A general map of these areas can be found in the wildfire section on Map 5-46. Areas near these burn areas, at the bottom of steep slopes, and near creeks, streams, and irrigation ditches could be considered most at risk for flash flooding.

Flooding – Riverine and Flash Vulnerability

Although many of the floods in Broadwater County have historically been caused by ice jamming, a traditional riverine flood is still possible. According to the State Floodplain Manager, no repetitive loss properties through the National Flood Insurance Program have been identified in Broadwater County. This information is not surprising since as of December 31, 2002, Broadwater County only had 2 flood insurance policies.

Overlaying the local structure data with the FEMA Q3 digital floodplain data as shown in Map 5-35, 70 structures are estimated to be in the floodplain. This estimation may be off due to the inaccuracies involved with the Q3 floodplain data and the structure data. FEMA's Q3 digital floodplain data is not exact and is based on mapping derived from the paper maps to provide a general floodplain area. In addition, some of the structures mapped may be recreational type facilities or may not be mapped in their exact locations relative to the floodplain. The estimate of 70 structures in the floodplain, however, will be used for loss estimation purposes.

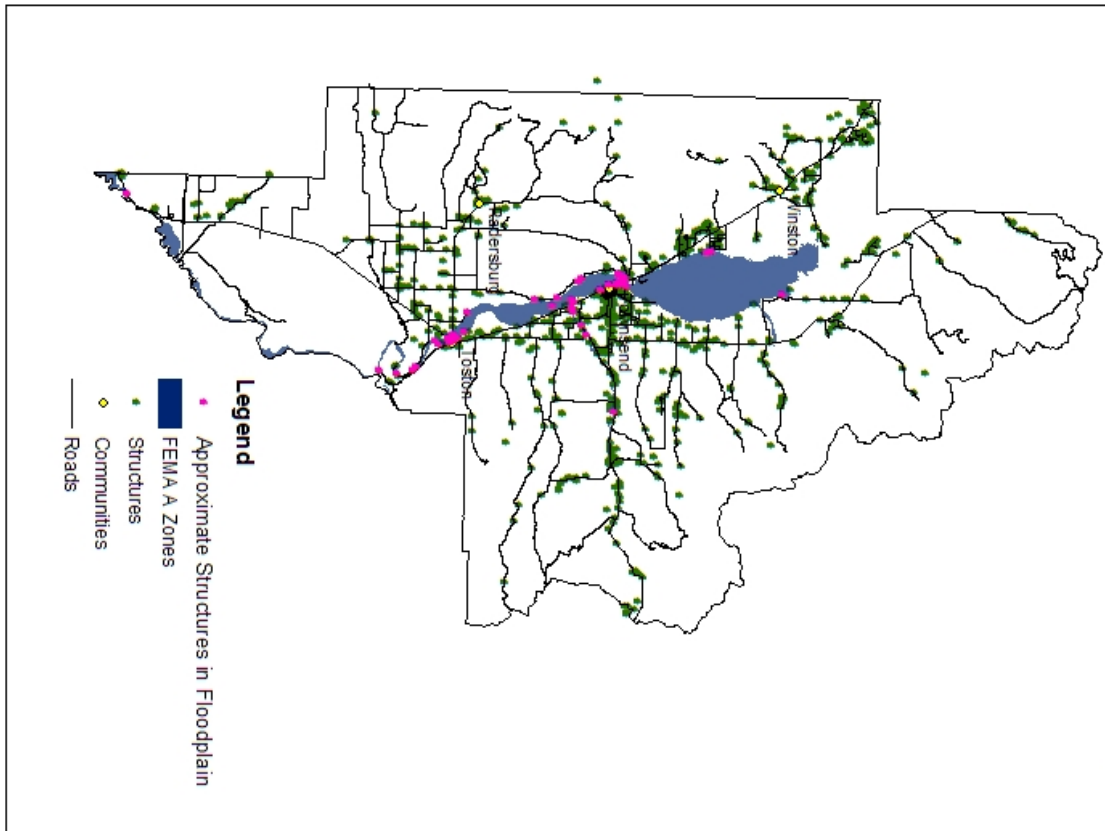
With a total of approximately 70 structures in the 100-year hazard area, damages could be estimated at \$1,795,500 (70 structures x \$85,500/average structure x 30% damage factor). Based on this analysis, the Toston Fire Station and the Montana Fish, Wildlife, and Parks offices are in the floodplain. The Toston Fire Station could be estimated to have \$41,770 in damages (\$139,231 value x 30% damage), if the structure was 30% damaged.

The vulnerabilities to flash flooding are harder to quantify without specific hazard data. In Montana, however, flash flooding has been known to be most problematic to county infrastructure such as roads. Muddy Lane in Broadwater County has been identified as a problem road by one member of the LEPC. Specific facilities have not been identified as susceptible to flash flooding.

The population impacts are considered moderate because some advanced warning of flooding is possible, particularly with riverine flooding. The impacts could be greater, however, with flash flooding, especially in the wildfire burn areas. Flash flooding many times occurs without warning.

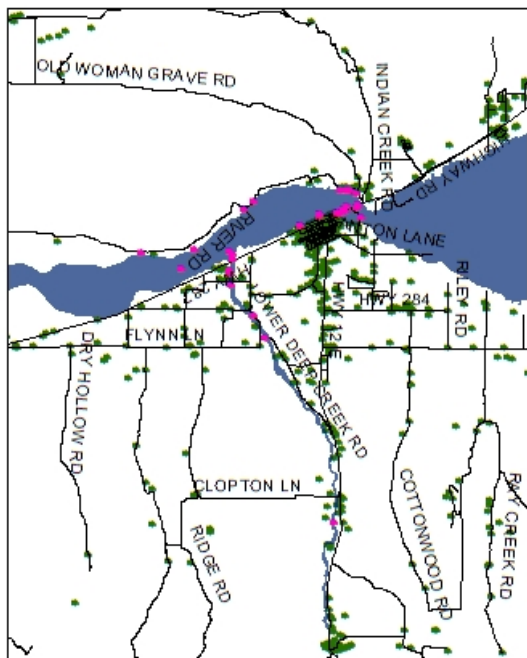
Riverine and flash flooding is considered the #9 priority for mitigation by the mitigation planning committee based only a minor history of riverine flooding and flash flooding. This committee believes the probability of disastrous flooding in the county is a **low probability** and if an event occurred would have a **low magnitude** or impact on the community.

Broadwater County, MT 100-year Floodplain **A Zones as designed by FEMA**

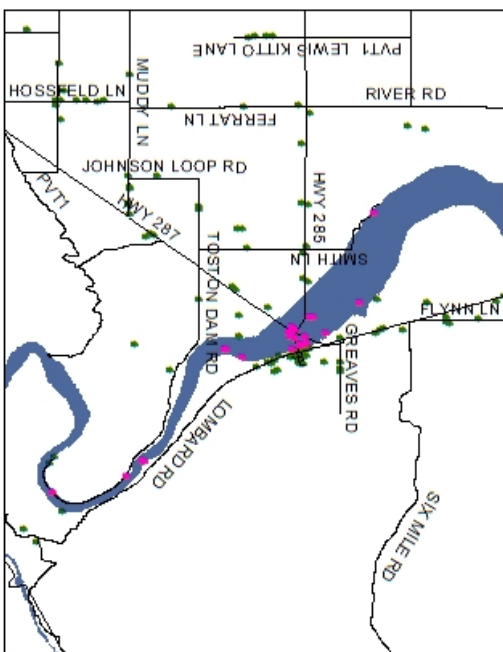


Data Source: Federal Emergency Management Agency Q-3 Data

Townsend Area



Toston Area



HAZARDOUS MATERIALS

Broadwater County is exposed to hazardous materials in many areas. The community has identified fixed facilities and transportation routes to be the areas of greatest concern. An accidental release of materials could produce a health hazard to those in the immediate area and downwind. Based on information from public meetings and knowledgeable first responders, numerous hazardous material facilities exist throughout the County, but particularly near Townsend.

Of specific concern are the three propane plants and an empty, abandoned gas tank. These facilities present significant hazards given their close proximity to the railroad and the City of Townsend. A train derailment could potentially puncture and ignite one of the tanks resulting in a huge explosion. Approximately 17-21 trains per day pass through Broadwater County according to committee members.

A major fuel pipeline, the Yellowstone Pipeline, also runs through the middle of Broadwater County. This pipeline transports refined petroleum products between Billings, MT and Spokane, WA and would have disastrous effects if an explosion or leak occurred.

A major vehicle transportation route to Helena runs through Broadwater County with the potential for a serious accident involving hazardous materials. If such an accident occurred near Townsend, serious human impacts could result.

All of these hazards could also become significant as secondary events during an earthquake. A hazardous materials incident resulting in a local emergency declaration has not occurred to date in Broadwater County, however, the community does not want to wait until one does happen to attempt to mitigate this hazard.

The approximate locations of the fixed facilities containing hazardous materials that are kept on file by the LEPC are shown on Map 5-36. These businesses are within the City of Townsend and have been identified in the Broadwater County Emergency Operations Plan as “high hazard.” The facilities, specifically, are:

- Amerigas – Propane Tank – west of Front Street between 5th and 6th streets
- Rocky Mountain Agronomy Facility - Fertilizer/Feed Plant – west of railroad tracks between B Street and Broadway
- Townsend Seed, Inc. – Farm Chemicals – west of Front Street between B Street and Broadway
- Visocan Petroleum – Petroleum Products – west of Front Street across from B Street
- Rocky Mountain Supply, Inc. – Petroleum Products – east of Front Street between D and C streets
- Northwestern Energy – Propane Tank – west of railroad tracks near split between 2nd and 3rd streets

Map 5-37 shows the transportation routes that have been identified in the Broadwater County Emergency Operations Plan that transport hazardous materials and the Yellowstone Pipeline.

A radius or buffer zone was placed around each fixed site, transportation route, and the pipeline and is shown in Map 5-38. These zones indicate the general areas that are at greatest risk from a transportation or pipeline accident. The distance for the radius around each facility and the buffer

zones were chosen based on suggestions by a member of a regional hazardous materials team located in Bozeman, MT. For the fixed facilities, some have a greater radius than others due to the type of materials used or stored, but for simplicity, the individual radii are not shown. Maps 5-39 through 5-41 show more detailed maps of the Townsend, Winston, Radersburg, and Toston areas.

Hazardous Materials Vulnerability

As with many hazards, the degree of risk to a particular area is hard to quantify, however, buffer zones were created around the facilities and transportation routes to show the areas that would most likely be affected in a hazardous materials incident. Of course, the entire County is at some risk for a hazardous material release, but the areas shown in Maps 5-38 thru 5-41 are at the greatest risk given their proximity to areas where hazardous materials can typically be found.

Table 5-14 shows the at-risk population and property for each sector of hazardous materials storage or transportation. In many instances, however, a structure may be located in an area prone to incidents from multiple sources. The final row of the table shows the composite from all hazardous material sources. The population in the area is based on 2.2 people per structure as derived from US Census data of 2,002 housing units and a population of 4,385. The estimated dollar losses are calculated based on the number of structures in the hazard area, the estimated damage function, and percent of that area that would reasonably be affected in an event. Again, the estimated damage function will be 30%, as has been used in other hazards since some structures may be completely destroyed while others receive minor damage in an explosion due to a hazardous material release. Many events may not cause structural damage but could have large population impacts in a toxic, non-explosive release. Also note that an event in or near Townsend would have a greater impact than one in a more rural area.

An obvious difference exists between the fixed facility hazard areas and the transportation route hazard areas. A fixed facility would affect a large percentage of its hazard area whereas the transportation routes would only affect those areas around the point source and not the entire hazard area identified in Maps 5-38 through 5-41. To allow for comparisons, the following percentages will be applied to the specific hazard areas to demonstrate a reasonable estimate of the total hazard area that may be impacted in a specific event:

- Fixed Facilities – 65%
- Railroad – 2%
- Yellowstone Pipeline – 2%
- Vehicle Routes – 1%

Table 5-14

Estimated Impacts from Hazardous Materials in Broadwater County				
Hazardous Materials Sector	Estimated # of Structures in Total Hazard Area	Estimated Population in Total Hazard Area	Potential Critical Facilities Impacted	Estimated Population Impact and Dollar Losses from an Event
Fixed Facilities	895	1,969	<ul style="list-style-type: none"> • Broadwater County Courthouse • Broadwater County Jail • Townsend City Offices • Broadwater Health Center • Townsend Fire Station • Broadwater County Search and Rescue Building • Water Tower • City/County Public Works Shop • Shelter – LDS Church • Montana Department of Transportation • Cecelia Hazelton Elementary & Junior High School • Broadwater High School • State/County Public Assistance Offices • Broadwater County Museum • Senior Citizens' Center • Montana Fish, Wildlife, & Parks Office • Townsend Post Office • Federal Offices (USDA) 	1,280 \$14,921,888

Table 5-14 (continued)

Estimated Impacts from Hazardous Materials in Broadwater County				
Hazardous Materials Sector	Estimated # of Structures in Total Hazard Area	Estimated Population in Total Hazard Area	Potential Critical Facilities Impacted	Estimated Population Impact and Dollar Losses from an Event
Railroad	973	2,141	<ul style="list-style-type: none"> • Broadwater County Courthouse • Broadwater County Jail • Townsend City Offices • Broadwater Health Center • Townsend Fire Station • Toston Fire Station • Winston Fire Station • Broadwater County Search and Rescue Building • Water Tower • City/County Public Works Shop • Toston Dam • Montana Department of Transportation • Cecelia Hazelton Elementary & Junior High School • Broadwater High School • State/County Public Assistance Offices • Broadwater County Museum • Senior Citizens' Center • Montana Fish, Wildlife, & Parks Office • US Post Office - Townsend • US Post Office - Toston • Federal Offices (USDA) 	<p>43 \$499,149</p>

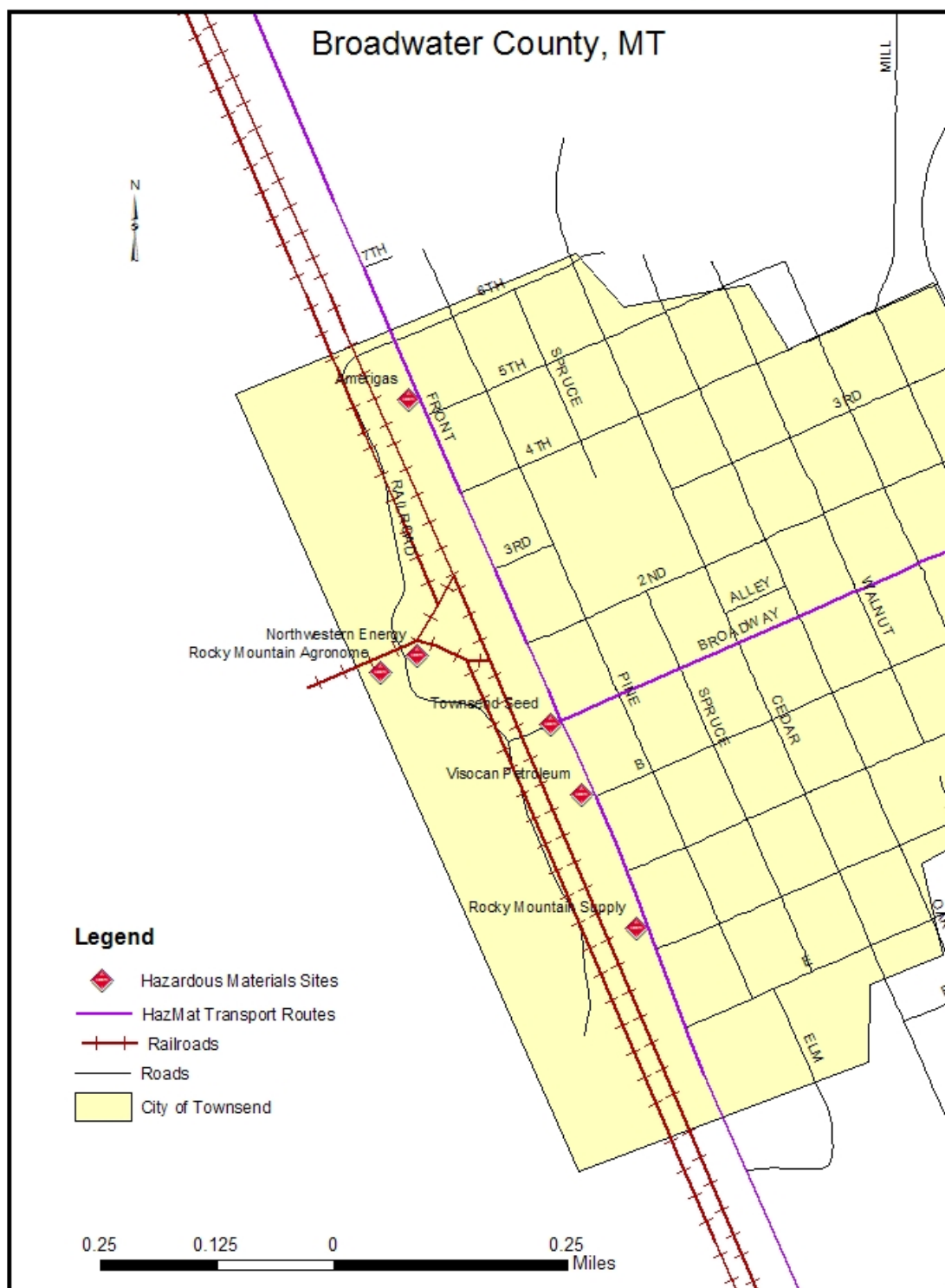
Table 5-14 (continued)

Estimated Impacts from Hazardous Materials in Broadwater County				
Hazardous Materials Sector	Estimated # of Structures in Total Hazard Area	Estimated Population in Total Hazard Area	Potential Critical Facilities Impacted	Estimated Population Impact and Dollar Losses from an Event
Yellowstone Pipeline	34	75	None	2 \$17,442
Transportation Routes	1,517	3,338	All, except the Transfer Station and Toston Dam	34 \$389,111
All HazMat Hazard Areas	1,597	3,514	N/A	N/A

An important note to Table 5-14 is that the figures are very general estimates and an actual event would be driven by many variables such as incident location, weather conditions, and the type and amount of material released.

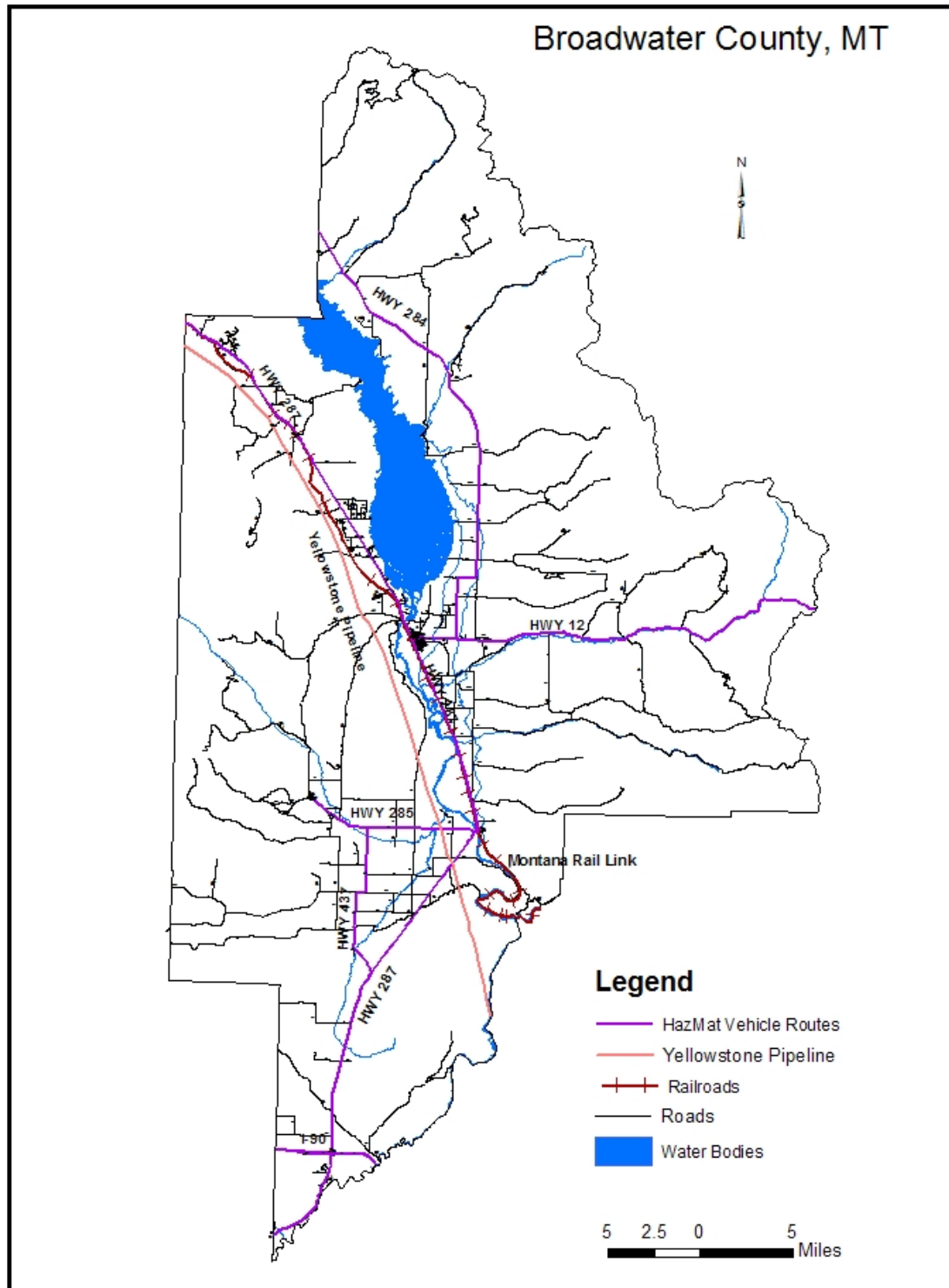
The planning committee has rated this hazard as having a **moderate probability** of occurring. If an incident were to occur, the committee believes the event could have a **high magnitude** or severe impact on their community. For these reasons, the committee ranked this hazard as the #1 priority for mitigation.

Hazardous Materials Fixed Sites



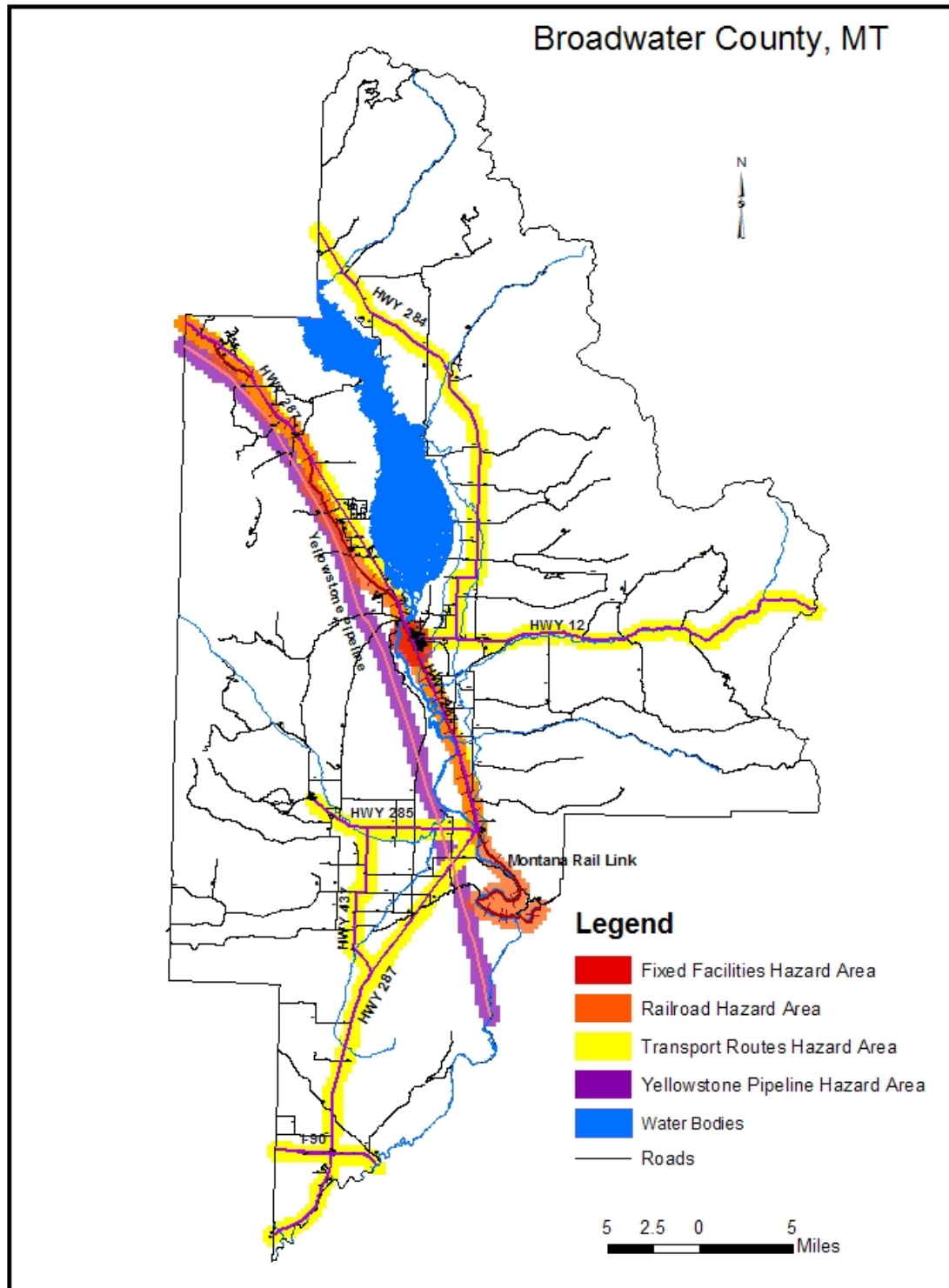
Data Source: Broadwater County Local Emergency Planning Committee

Hazardous Materials Transportation Routes



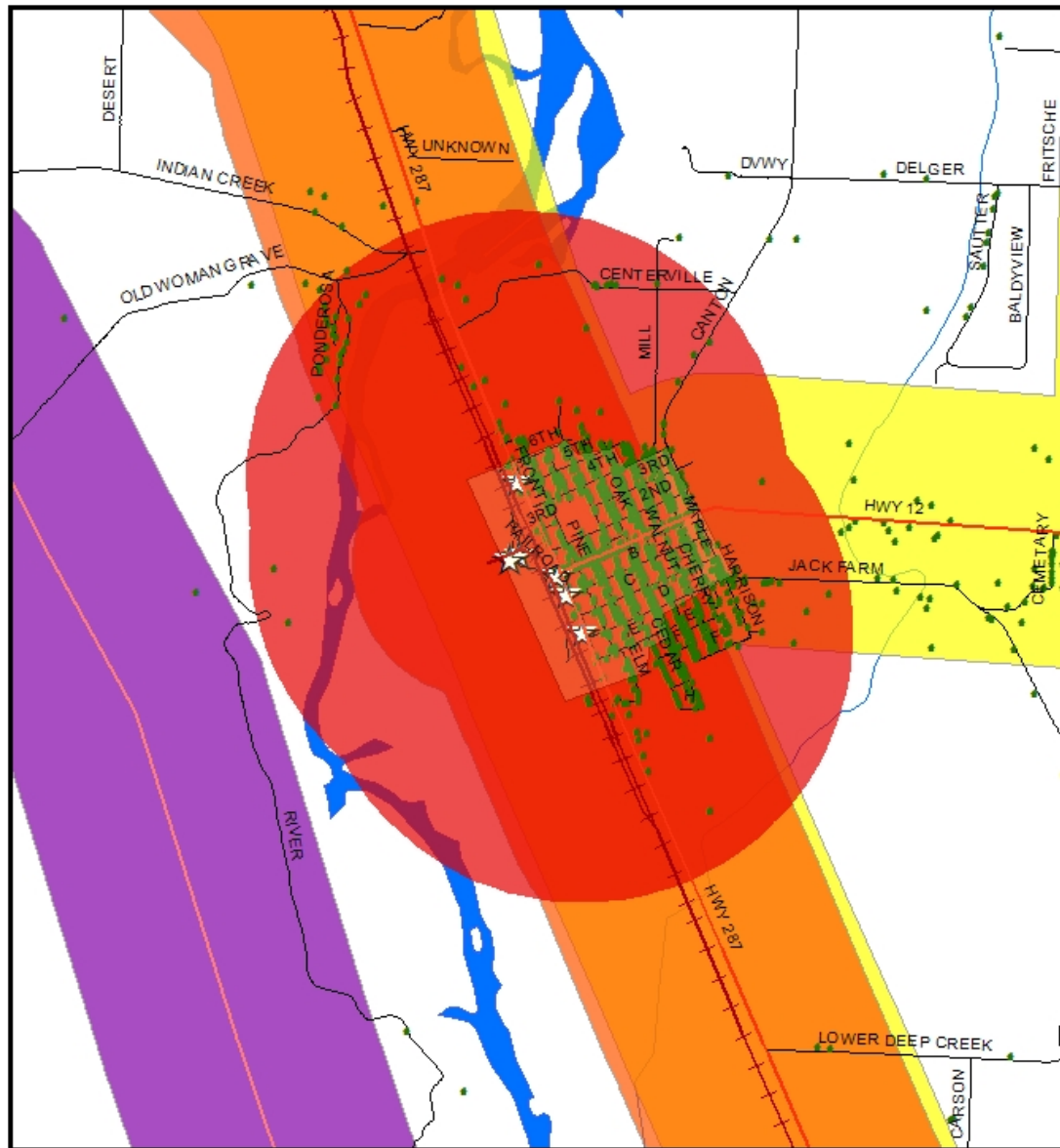
Data Source: Broadwater County Local Emergency Planning Committee

Hazardous Materials High Hazard Areas



Data Source: Broadwater County Local Emergency Planning Committee

Hazardous Materials High Hazard Areas - Townsend Area



Data Source: Broadwater County Local Emergency Planning Committee

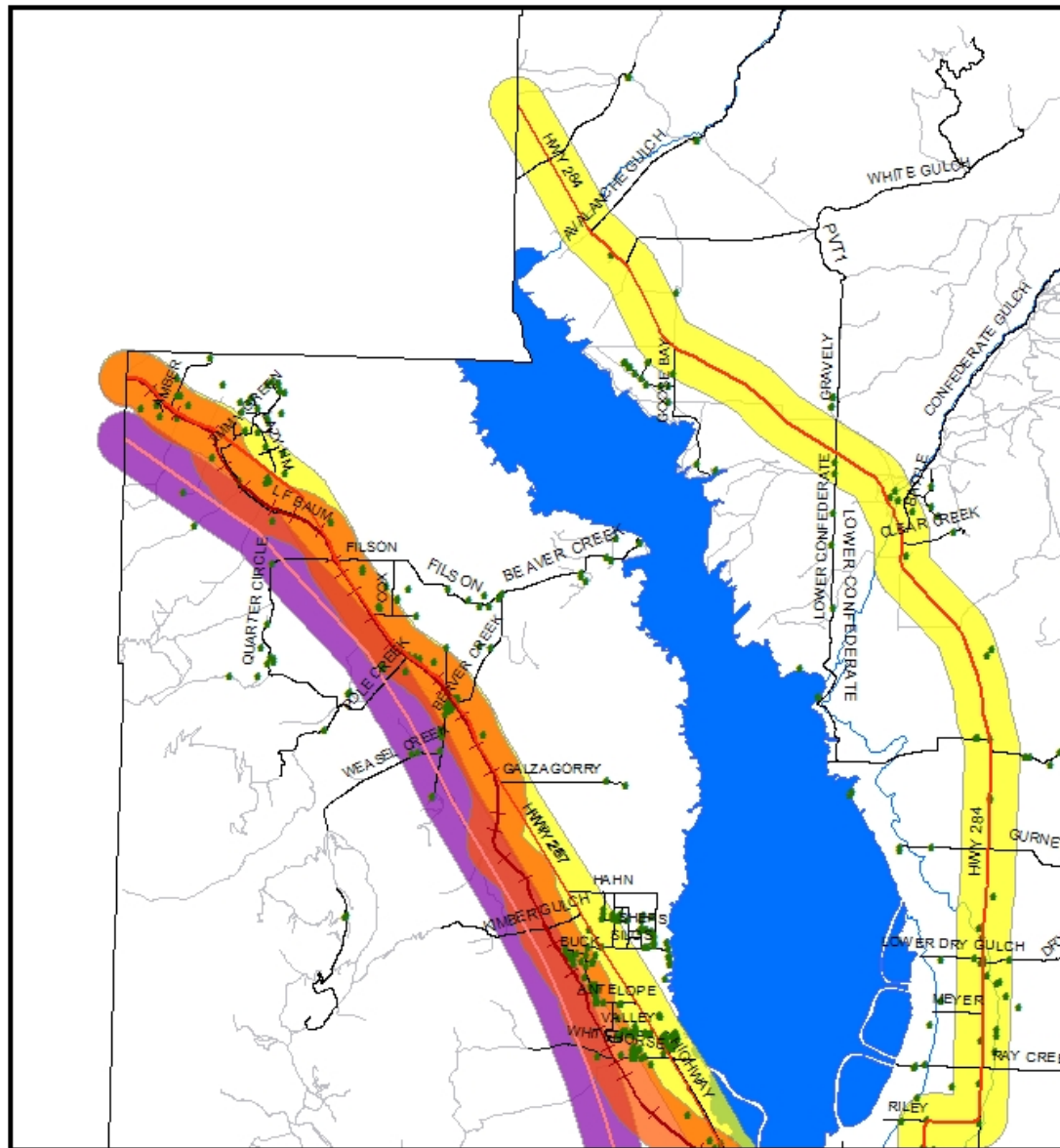


1 0.5 0 1 Miles

Legend

- Fixed Facilities Hazard Area
- Railroad Hazard Area
- Transport Routes Hazard Area
- Yellowstone Pipeline Hazard Area
- ++ Railroads
- ☆ Hazardous Materials Sites
- Yellowstone Pipeline
- HazMat Transport Routes
- Structures
- City of Townsend
- Roads
- Water Bodies

Hazardous Materials High Hazard Areas -Winston Area



Data Source: Broadwater County Local Emergency Planning Committee

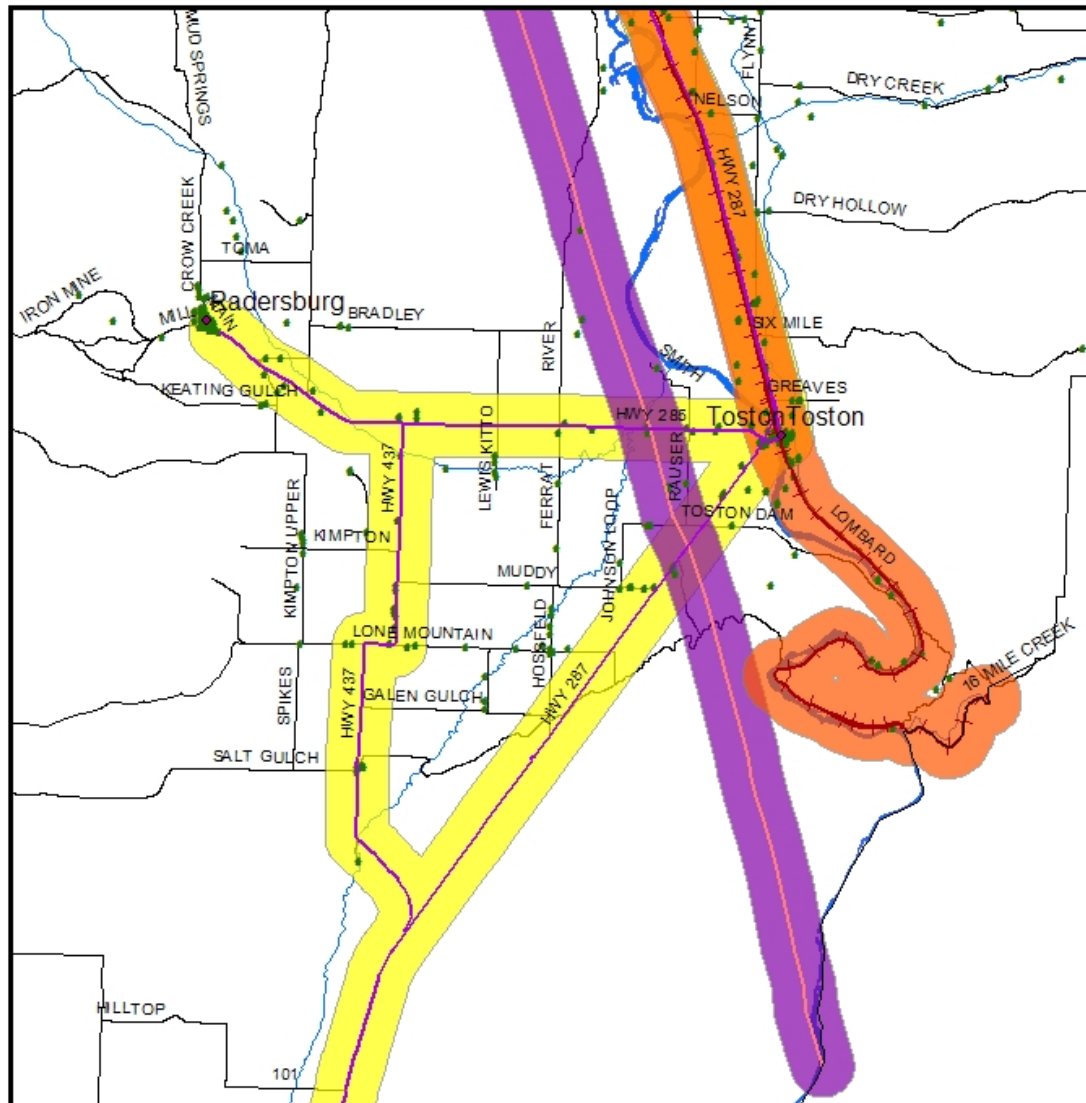


1 0.5 0 1
Miles

Legend

- Fixed Facilities Hazard Area
- Railroad Hazard Area
- Transport Routes Hazard Area
- Yellowstone Pipeline Hazard Area
- Railroads
- Hazardous Materials Sites
- Yellowstone Pipeline
- HazMat Transport Routes
- Structures
- City of Townsend
- Roads
- Water Bodies

Hazardous Materials High Hazard Areas - Radersburg & Toston Areas



2 1 0 2 Miles



Legend

- Railroad Hazard Area
- Transport Routes Hazard Area
- Yellowstone Pipeline Hazard Area
- Railroads
- HazMat Transport Routes
- Yellowstone Pipeline
- Structures
- Water Bodies
- Roads

Data Source: Broadwater County Local Emergency Planning Committee

ISOLATION

Through information gathered at public meetings and from concerned emergency responders, the potential for the isolation of the majority of Broadwater County's population exists. Both of the major roads to the North and the South out of the county have bridges that could fail. This situation would isolate residents between the bridges from the services in Bozeman and Helena. Those Broadwater County residents outside of the bridge areas would be isolated from their county seat in Townsend. To the North is the Townsend Bridge and to the South is the Toston Bridge. Initial data from the earthquake loss estimation software (HAZUS) indicates an earthquake could cause problems to one or both of these bridges. For these reasons, the County believes this potential incident should be addressed in this plan.

The Townsend Bridge was built in the early 1980's and the Toston Bridge in the late 1950's. The locations of the bridges are shown in Map 5-42.

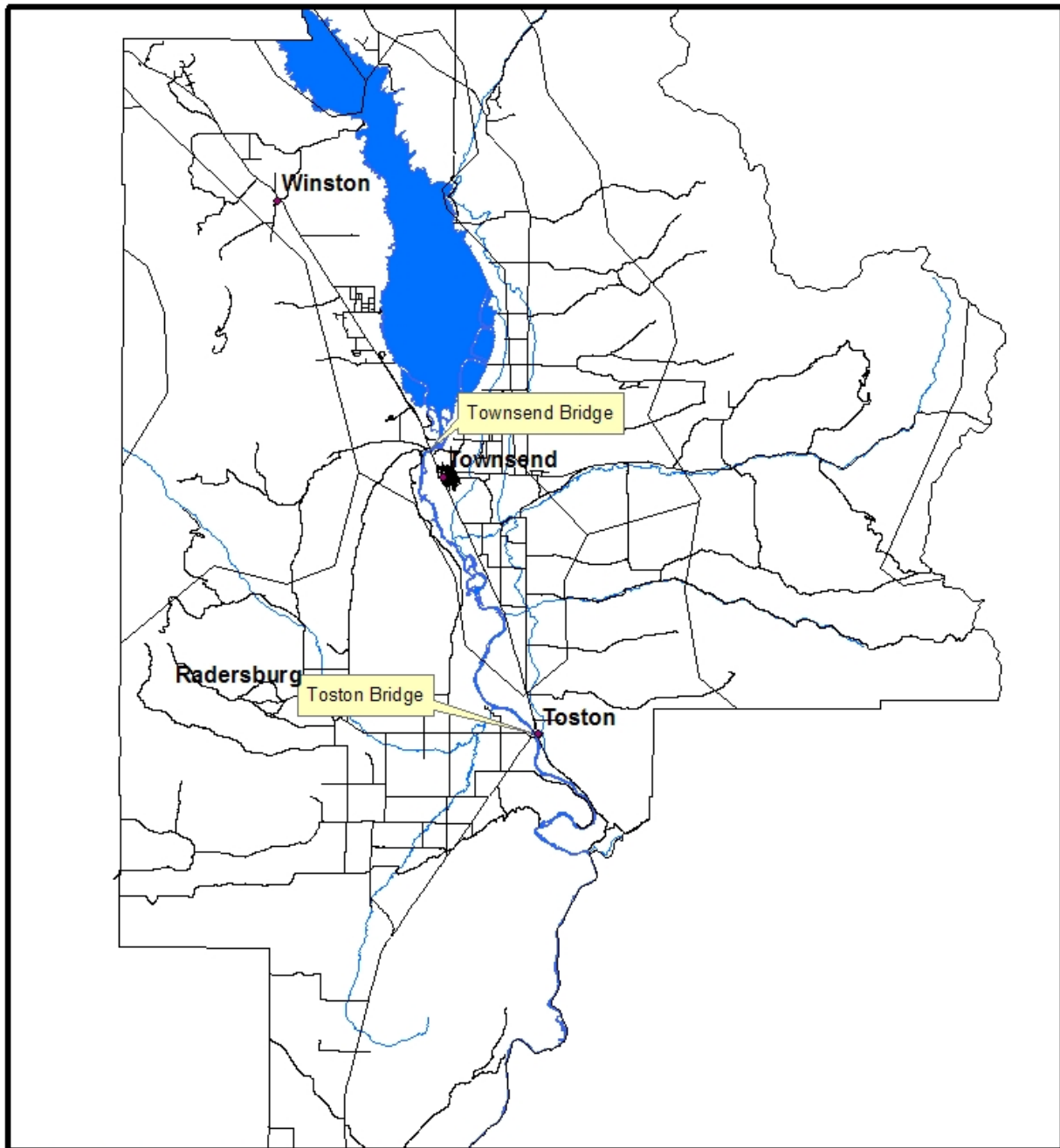
Broadwater County has not had an incident to date where either one of the bridges has failed. An extreme event such as an earthquake, flooding, or terrorism would need to occur to take out both of the bridges. Residents, however, are concerned about such an event occurring as the bridges continue to age.

Isolation Vulnerability

The hazard would not have direct impacts on property, however, the population could be impacted under the right conditions. In many cases, loss of one or both of these bridges would serve as an inconvenience to residents, however, the greatest impact would most likely be to emergency services such as fire and EMS. In particular, were this event to occur in conjunction with another event such as an earthquake or flood, as it most likely would, many residents could be isolated from these County services or increase response times dramatically. Assistance from other counties would probably have to be relied upon.

This event has been categorized as a **low probability** with a **low magnitude** if an isolation event were to occur. Isolation has been ranked as the #15 out of 19 hazards for mitigation.

Primary Bridges North and South from Townsend



Data Source: Broadwater County Local Emergency Planning Committee

- Legend**
- Roads
 - ◆ Communities
 - Water Bodies



0 2.5 5 10 Miles

LANDSLIDE

Given the steep terrain in parts of Broadwater County, a potential does exist for landslides. A major landslide occurred in nearby Madison County during the Hebgen Lake earthquake. In addition, a USGS study has identified areas of Broadwater County as susceptible to landslides. This study, USGS Open-File Report 97-289 by Jonathan W. Godt, looked at incidence and susceptibility of landslides on a nationwide basis. Therefore, the areas identified are general and not exact on the county scale. Map 5-43 shows the general areas within Broadwater County. Much of the western third of the County lies in a moderate incidence or high susceptibility/low incidence area. A marginal section in the northern section of the County is in a moderate susceptibility/low incidence area. The following is noted in the USGS study, "Susceptibility is not indicated where same or lower than incidence. Susceptibility to landsliding was defined as the probable degree of response of [the areal] rocks and soils to natural or artificial cutting or loading of slopes, or to anomalously high precipitation. High, moderate, and low susceptibility are delimited by the same percentages used in classifying the incidence of landsliding. Some generalization was necessary at this scale, and several small areas of high incidence and susceptibility were slightly exaggerated."

Historically, damages have not been recorded in the County due to landslides. The majority of the land within the landslide hazard area is part of the Helena National Forest, although the Radersburg area falls within the high susceptibility/low incidence section. Again, however, this hazard area could reflect a generalization over a large area. A more specific study would need to be conducted to accurately profile this hazard.

Landslide Vulnerability

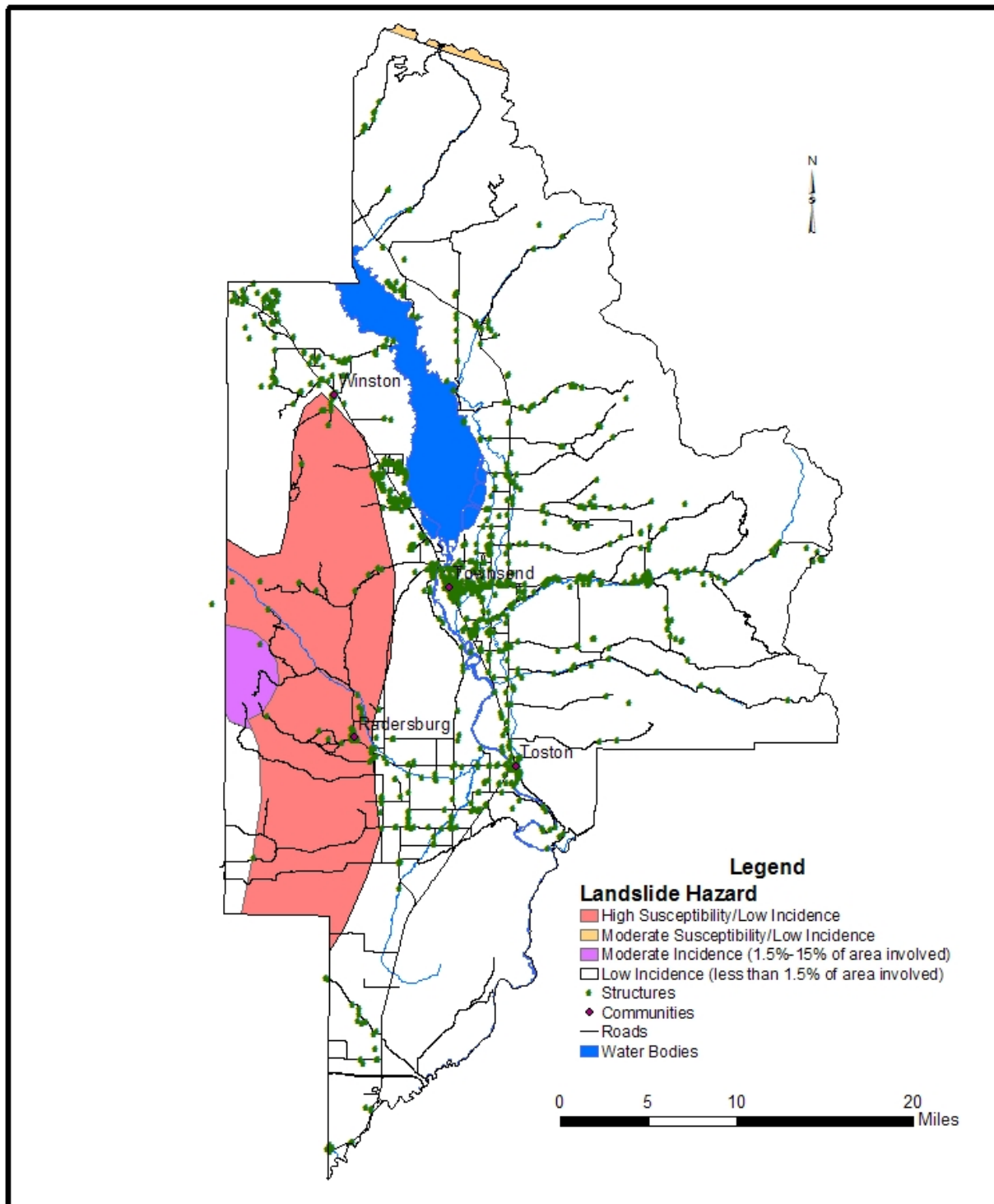
The specific vulnerabilities to landslide are difficult to determine with only very general data to base an analysis on. More site specific information could determine if a structure or area is at risk for landslides. Using the best available data, however, 107 structures are within a landslide susceptibility or incidence area. Included in this hazard area are the Radersburg Fire Station and the Broadwater County Transfer Station. To determine potential losses, a more detailed study of the landslide hazard would need to be undertaken. Mostly likely, a landslide would only affect a small part of the entire hazard area.

The mitigation planning committee describes landslides as a **low probability** event that would have a **low magnitude** or low impact on the community if one were to occur. This hazard has been ranked as #17 for mitigation priorities.

Landslide Hazard Overview

Broadwater County, MT

Map 5-43



Data Source: US Geological Survey Open File Report 97-289

RECREATIONAL HAZARDS

Within Broadwater County is Canyon Ferry Lake, stretching from the Northwest corner of the County southeast to Townsend. This lake, almost entirely within Broadwater County, has 35,181 surface acres and 76 shoreline miles according to the Bureau of Reclamation's website. This lake offers vast fishing, camping, boating, swimming, and wildlife viewing opportunities. These opportunities attract many visitors and residents throughout the year. For these reasons, a lightning strike, boating incident, multiple drownings, or other significant event may overwhelm the capabilities and resources of the County. Local officials have specifically requested that these hazards be included in the mitigation plan. The lack of studies or records of historical events make profiling the probability or magnitude of an event hard to determine. In June 2002, however, during the Walleye Fishing Tournament, an abrupt wind caused five boats to tip over in Broadwater County with at least six others tipping in neighboring Lewis & Clark County's area.

For this hazard, the Canyon Ferry Lake area and its associated campgrounds and marinas are the areas at greatest risk. With the Missouri River also offering fishing and other recreational opportunities, this waterway could also be considered a hazard area.

Recreational Hazards Vulnerability

The vulnerability to the community from recreational hazards is primarily to the population. A large scale incident with multiple casualties could overwhelm the County resources. This impact to the population would be relatively low, however, the resources needed to deal with a large event would be limited and could reach the magnitude of needing outside assistance. The mitigation planning committee that came up with this hazard believes that the probability of a large-scale recreational incident is a **low probability** with the impact to the community being of **low magnitude**. The hazard has been ranked as #13 for mitigation.

STRUCTURE FIRES

Although structure fires are usually individual disasters and not community-wide ones, the potential exists for widespread structure fires as expressed during public meetings. Many housing developments are without a water supply for fire protection. The areas of most concern, as identified by the Broadwater County Disaster and Emergency Services Coordinator, have been prioritized in the following order:

- 1 – Silos Area
- 2 – East Side of Canyon Ferry Lake
- 3 – Deep Creek Area
- 4 – Dry Creek Area
- 5 – Lazy HM Area
- 6 – Area between the railroad and the highway

Fires in these areas would be difficult for firefighters to control due to the lack of water and the need to fill tenders many miles away. This problem continues to grow as development occurs in areas without existing or created water supplies. This problem has also been identified in the County's Growth Policy Plan and Comprehensive Economic Development Strategy.

According to the Broadwater County Rural Fire District's Community Fire Plan written by Fire Logistics in October 2003, the Broadwater County Rural Fire District has an ISO rating of Class 10. This rating is established by the Insurance Services Office (ISO) and influences the premiums residents and businesses pay. The rating is determined by three factors: the water supply, the fire department, and fire dispatch. Of the ten ratings, Class 1 receives the most insurance rate recognition and Class 10 receives no recognition.

Structure Fire Vulnerability

As identified above, specific developments in the County do not have adequate water supplies for firefighting. The potential damages are limited to structures, most of which are probably insured, however, this problem also puts the population at a greater risk for injuries and deaths from structure fires. The vulnerability to each development can be estimated as follows in Table 5-15.

Table 5-15

Estimated Vulnerability for Major Structure Fires in Broadwater County		
Area	Estimated Number of Structures	Estimated Population
Silos Area	37	82
East Side of Canyon Ferry Lake	55	121
Deep Creek Area	90	198
Dry Creek Area	15	33
Lazy HM Area	20	44
Area between the railroad and the highway	70	154

The greatest vulnerability, however, is not necessarily to existing development but to future growth. This issue was considered when ranking this hazard. The probability of this hazard has been identified by the mitigation planning committee as a **moderate probability** that could have a **moderate magnitude** or severity to the community. The priority ranking for mitigation is #4.

TERRORISM

Although unlikely, Broadwater County could experience an international or domestic terrorist event. Bombings, snipers, release of radiological materials, chemical attacks, or bioterrorism are all possible. The Centers for Disease Control has identified the following diseases and agents as hazards: smallpox, radiation events, botulism, plague, anthrax, sarin nerve gas, mustard gas, ricin, and VX.

The Weapons of Mass Destruction/Terrorism Annex to the Broadwater County Emergency Operations Plan (EOP) lists the following examples of chemical agents that could be encountered:

- Nerve: Sarin
Soman
VX
- Blister: Mustard
Lewisite
Phosgene Oxime
- Choking: Phosgene
Chlorine
Vinyl Chlorine
- Blood: Hydrogen Cyanide
Cyanogens Chloride

The EOP also list the following examples of biological agents:

- Anthrax
- Arenaviruses (Junin, Lassa)
- Botulism
- Brucellosis
- Plague (Bubonic, Pneumonic)
- Smallpox
- Tularemia

With very little experience nationwide with these types of incidents and very little data locally on these hazards, a specific probability is hard to determine.

Terrorism Vulnerability

The County as a whole is susceptible to this hazard, however, critical facilities, hazardous materials locations, and City areas are at the greatest risk. The City of Townsend is the most populous part of Broadwater County with approximately 630 structures and 1,400 residents. This densely populated area, with close proximity to hazardous materials facilities and government buildings, could be considered the area at greatest risk for terrorism. Domestic and international terrorism can be hard to predict, and therefore, specific targets cannot be identified. As a whole, Broadwater County is at a very low risk of terrorism in comparison to other parts of the country with the exception of possibly agricultural/biological terrorism. As was identified in the disease section of this plan, livestock and poultry inventory data from 1997 showed that the County had 30,787 animals. Broadwater County also has plenty of crops that could become terrorist targets for disease. According to the Montana

Agricultural Statistics Service, cash receipts from crops in Broadwater County in 2001 totaled \$9,364,000. Again, although these areas make up a large part of the local economy, the sales are relatively small compared to other parts of the State and terrorists would not make a large statement, as they often try to do, in targeting Broadwater County.

The mitigation planning committee gave this hazard a **low probability** with a **low magnitude** or impact on the community and this hazard has been prioritized at #14 out of 19 hazards for mitigation.

TORNADOES & SEVERE THUNDERSTORMS

A severe thunderstorm is defined by the National Weather Service as a thunderstorm that produces wind gusts greater than 58 mph or hail $\frac{3}{4}$ " or larger. Although not considered "severe", lightning and heavy rain can also accompany thunderstorms. Severe thunderstorms with strong winds and large hail have occurred in Broadwater County. One tornado has also been recorded by the National Weather Service, however, due to a short reporting history and sparse population, others may have occurred. Limited weather observing capabilities and trained spotters exist in the County to report these events.

Confirmed by the National Weather Service in Great Falls, an F0 tornado on the Fujita scale touched down in Broadwater County on June 12, 1992 at about 4:45PM. This tornado was determined to have a width of 10 yards located at approximately 46.19N and 111.34W. No damages were reported with this tornado.

A history of severe thunderstorm winds and hail listed in Table 5-16 has been compiled from the National Climatic Data Center and National Weather Service Local Storm Reports.

Table 5-16

Severe Weather Events in Broadwater County				
Date	Location	Type	Speed or Size	Damages
6/27/70	Broadwater Co.	Severe Wind	Unknown	None Reported
6/15/88	Broadwater Co.	Severe Wind	70 mph	None Reported
7/15/89	Broadwater Co.	Severe Wind	Unknown	None Reported
5/28/93	25 Miles E of Helena	Severe Wind	Unknown	A barn roof was blown off and a granary was leveled at Avalanche Gulch - \$500K damage
7/12/01	20 Miles NE of Winston	Hail	1 inch diameter	None Reported
8/4/01	Toston	Severe Wind	60 mph	Peak wind gust estimated at least 60 mph as Agrimet automated station reported 57 mph winds averaged over 15 minutes
5/20/02	Toston	Severe Wind	65 kts	A severe thunderstorm near Toston tore the roof off a shed. The roof traveled 75 feet, before landing on top of a vehicle.
7/8/02	8 Miles E of Townsend	Hail	0.75 inch diameter	None Reported

Table 5-16 (continued)

Severe Weather Events in Broadwater County				
Date	Location	Type	Speed or Size	Damages
7/14/02	Broadwater County	Severe Wind	82 mph	A severe thunderstorm produced an 82 mph wind gust at Canyon Ferry Lake near Townsend, and a 61 mph wind gust in the City of Townsend. Numerous trees and power lines were knocked down. Hail up to one quarter inch was reported.
7/15/02	6 Miles NE of Townsend	Severe Wind	60 mph	None Reported
8/7/02	Winston	Hail	0.75 inch diameter	None Reported
8/21/02	13 Miles SW of Toston	Hail	1.75 inch diameter	None Reported
8/21/02	Townsend	Hail	0.88 inch diameter	None Reported

Based on the American Society of Civil Engineers publication ASCE 7-98, Broadwater County falls within Design Wind Speed Zone II (160 mph). The entire County is at risk from this hazard. Structures, utilities, and vehicles are most at risk from the wind component of these storms, with crops and agriculture being additionally threatened by hail. Mostly likely, though, only isolated areas would be affected by these types of storms rather than encompassing the entire County.

Tornadoes and Severe Thunderstorms Vulnerability

With the entire County at risk from tornadoes and severe thunderstorms, estimates of damages are hard to determine. Realistically, an event involving a tornado or severe thunderstorm would most likely affect a small area. If that area, however, was in a developed part of the County, 10-20 homes could be damaged. Fifteen homes at a damage factor of 30% would result in roughly \$384,750 in damages. In that instance, a small percentage of the population would also be at risk. Damages to a critical facility or vulnerable population would also increase the impacts of such an event. Especially for this hazard, the numerous campgrounds along Canyon Ferry Lake or in the National Forests become vulnerable populations. Occasionally, these events do occur without warning and could have a greater impact on the population. In terms of the economy, large hail could damage crops or injure livestock and diminish profits. The mitigation planning committee believes severe thunderstorms, and occasionally tornadoes, have a **moderate probability** of occurring with the potential for a **moderate magnitude** or impact on the community. This hazard has been ranked #7 in the ranking for mitigation.

VOLCANO

Although no known volcanoes exist within Broadwater County, an eruption hundreds of miles away can have disastrous effects on the County. Volcanic ash can blanket the County given the right conditions and cause damages. Volcanic areas do exist in the Cascade Range such as Mt. Saint Helens, Mt. Rainer, and Mt. Hood to the West and the Yellowstone Caldera to the South. Soil studies have shown that it is not uncommon to find volcanic ash layers present in the Broadwater County area. Unfortunately, frequencies for these types of events have not been determined, however, after the eruption of Mount St. Helens, a coating of about ¼ of an inch of ash fell on Broadwater County.

In May of 1980, Mt. Saint Helens erupted sending tons of ash into the atmosphere. The prevailing west wind aloft carried the ash to the east and deposited much of it over Montana, including Broadwater County. The State DES office estimates the damage to have been \$15 to \$20 million across the State. Soil examinations also show the County had ash from Glacier Peak eruption about 13,200 years ago and Mt Mazama 8,600 years ago. This examination estimates the return period of substantial volcanic ash fallout to generally once every 5,000-8,000 years. Active volcanoes still exist in this region of the United States, and therefore, another event cannot be ruled out.

Volcano Vulnerability

During Mt. St. Helens, the greatest costs came from the difficult task of removing volcanic ash. In Broadwater County, the greatest threat is not necessarily to people or residences but to property such as vehicles or equipment. The volcanic dust is corrosive to metals and without proper removal can certainly cause damages to public and private property. The removal of ash from government facilities and infrastructure could certainly create costs beyond the community's capabilities. Given the low occurrences of volcanic eruptions, the mitigation planning committee has assigned a **low probability** to this hazards and believes an event would be of **low magnitude** or impact to the community should an eruption occur. Volcanic hazards have been given the lowest ranking of #19 out of all the hazards identified for mitigation priorities.

WILDFIRE

Broadwater County's history with wildfires, the mountainous terrain, and large areas of the County encompassed by the Helena National Forest has prompted the community to identify wildfires as a significant hazard. Fuels mapping and hazard ratings for Broadwater County are in the process of being completed. Map 5-45 shows the Crown Fire Potential developed by the US Forest Service. The USFS believes that Crown Fire Potential is a good indicator of the hazard to the community and is inversely related to its ability to protect structures.

The Broadwater County Rural Fire District (RFD) has developed a Community Fire Plan as part of the National Fire Plan. This plan generally defines the wildfire problems in Broadwater County.

The potential fire hazards can best be discussed by reviewing the large fire history for the County. Analysis of large fires in Broadwater County indicates a significant reduction in large fires toward the end of the 19th century. The reductions in size resulted from changes in the land use patterns and previous stand replacement fires that treated over mature stands throughout the County. During the 20th century, those stands of timber matured under a successful fire suppression policy to the extent that fire has had very limited opportunity to play its natural role in the forested communities.

As we enter the 21st century, Broadwater County is living with stands of mature and over mature ponderosa pine and lodgepole pine. The age class and condition of these stands make them very susceptible to infestation from insects and disease, which increases the risk for a stand replacement wildland fire.

During the last three decades of the 20th century, land use patterns have changed the historic look of Broadwater County. Development, of rural areas from primarily agricultural use to home sites for permanent and seasonal residents, presents a significant problem to the Broadwater County RFD.

Long term drought is another factor that needs to be considered a potential hazard. In reviewing the climatic conditions that Broadwater County has experienced since 1988, the drought's significance is very evident in both the forested and brush vegetative communities. Mortality as a result of the drought will continue to increase the natural fuel loading, which in turn raises the County's potential for significant wildland fire incidents.

Recently, the 2000 wildfire season resulted in a federal disaster declaration for Broadwater County and the rest of Montana. The Bucksnot, Cave Gulch, and Toston-Maudlow Fires all burned parts of Broadwater County. Specifically, the Toston-Maudlow fire prompted evacuations, threatened homes, and burned acres of Broadwater County during the middle of August. Prior to that fire, however, the County had already issued an emergency proclamation on July 24, 2000 for the Canyon Ferry Complex including the Bucksnot and Cave Gulch fires. A map of the areas that burned within the County is shown in Map 5-46. A major 500,000 volt power line for the Northwest United States was threatened during the fires according to a CNN website article on 8/18/00. This fire burning from Maudlow to Toston destroyed a trailer and a garage. Knowledgeable residents of Broadwater County estimate hundreds of thousands of dollars worth of fences were destroyed. In addition, just one landowner attending the mitigation meeting lost \$100,000 in trees. County records show that \$634,433

was spent on the Toston-Maudlow fire at the County level alone. A disaster was declared by the County on August 21, 2000.

Research of County records shows a fire event on July 27, 1990 when a large wood chip fire broke out. A disaster was declared on August 16, 1990 by the County due to the poor air quality and the resultant cost of \$24,205. Historical records also show during the summer of 1988 the Spring Creek fire burned through forested areas of Broadwater County.

Wildfire Vulnerability

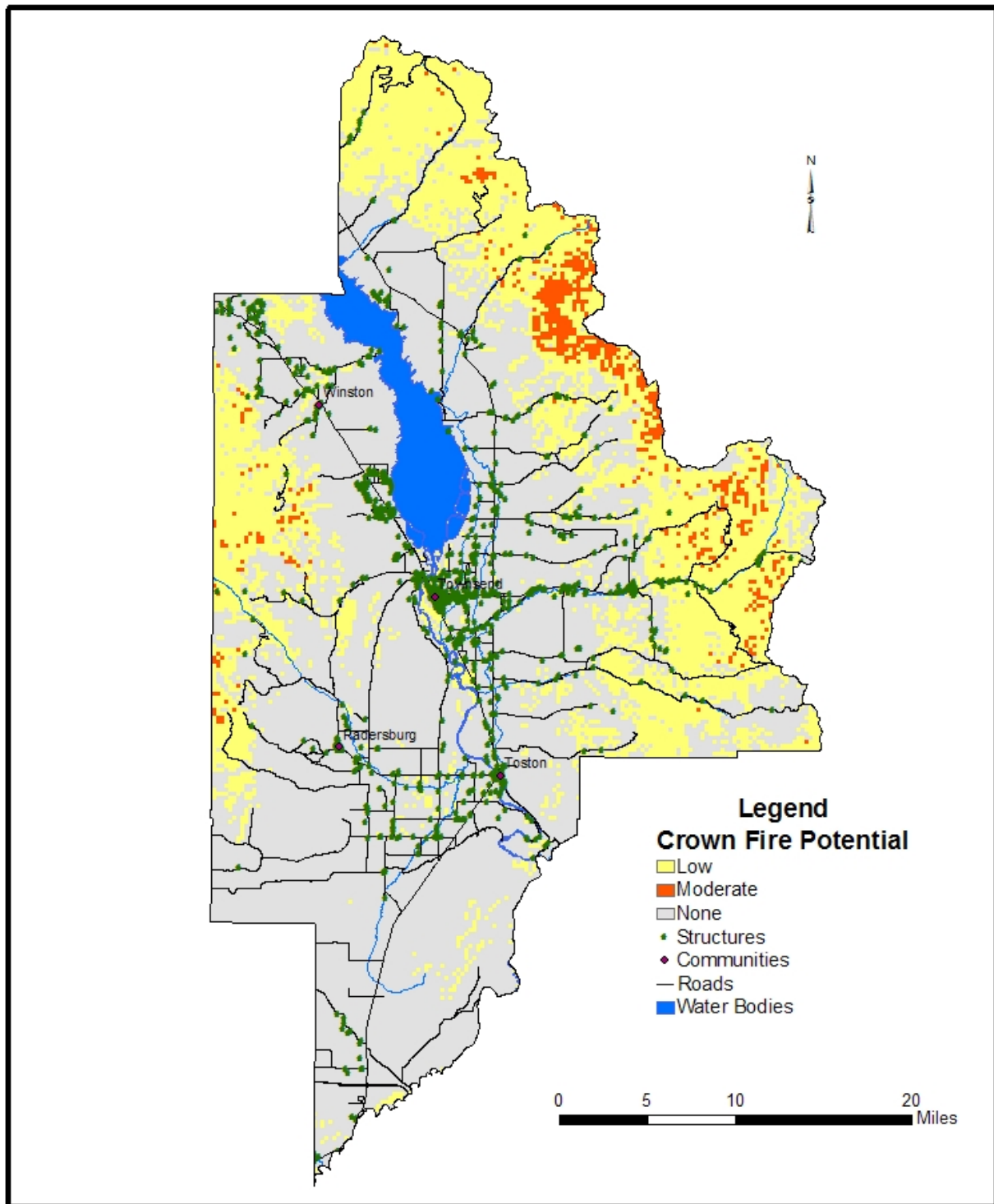
Wildfires have the greatest potential to substantially burn national forest areas, however, private residences become threatened when the fire enters the wildland-urban interface. Several areas of interface exist in Broadwater County. Using the crown fire potential map in conjunction with the structure data, an estimate of the number of structures in the interface was derived. Approximately 9 structures are located in or near a moderate crown fire potential area and 114 structures are in or near a low crown fire potential area. With a 50% loss estimate on the moderate area structures in any given wildfire, a loss of \$384,750 can be approximated. Using a damage estimate of 30% on the low area structures, \$2,924,100 in losses can be estimated for a total of \$3,308,850 in the crown fire potential areas. The identified critical facilities all lie outside of the wildland-urban interface as determined by the crown fire potential map. The impact on the population can be considered moderate. In many cases, residents can be evacuated before the fire moves into their area. Some residents, however, may choose to remain in the evacuated area.

Although the primary concern is to structures and the interface residents, most of the costs associated with fires, at least historically in Broadwater County, come from firefighting efforts. Additional losses to natural resources, water supplies, and air quality are also typically found. As past events have also shown, infrastructure such as power transmission lines can also be threatened.

Given Broadwater County's history of large wildfires and the high hazards that still exist, the community has rated wildfire as having a **moderate to high probability** of occurring with potentially a **high magnitude** or severe impact on the community. This hazard has been ranked #2 on the priorities for mitigation.

Crown Fire Potential

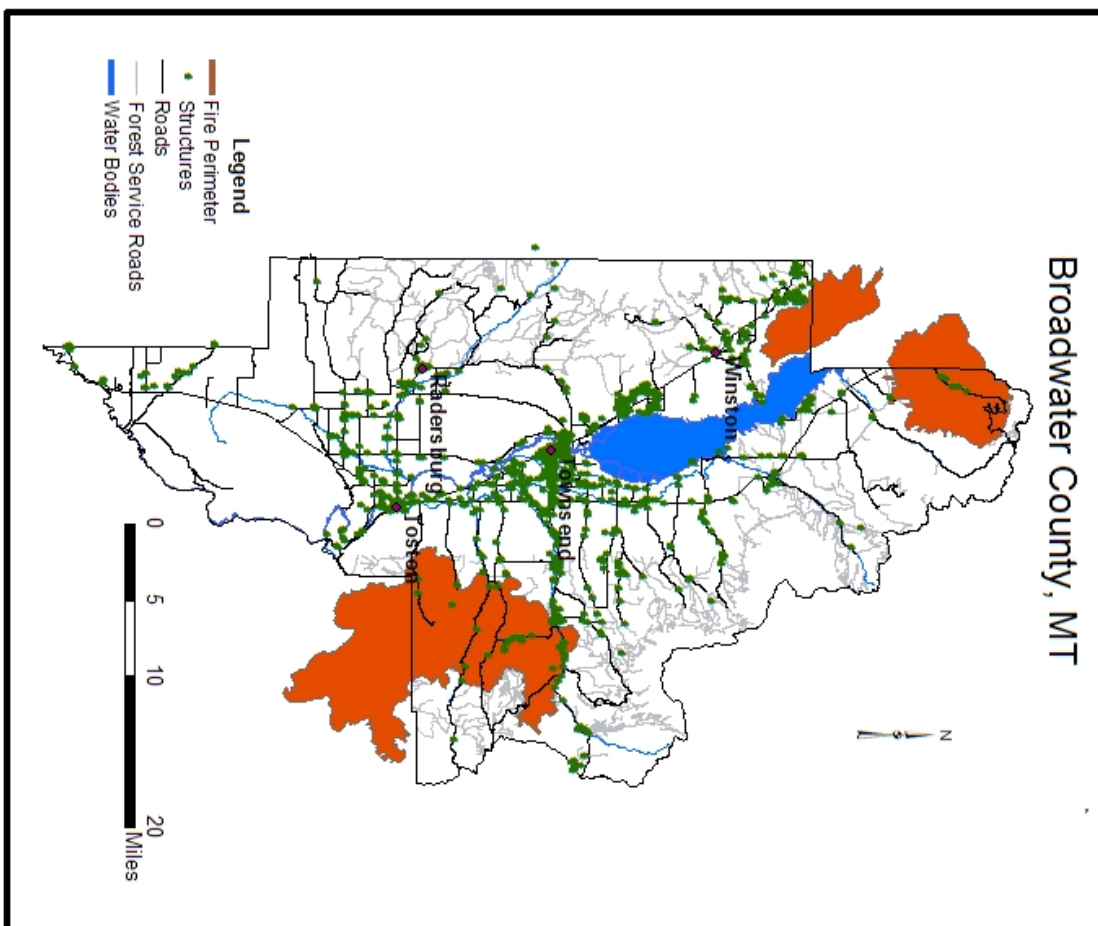
Broadwater County, MT



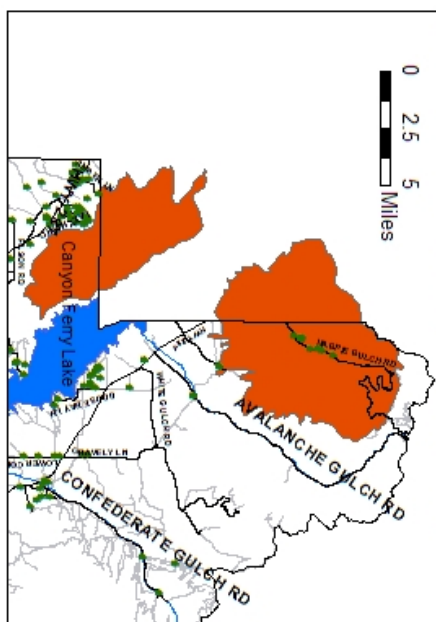
Data Source: US Forest Service, Region One

Fire Perimeter from the 2000 Fire Season

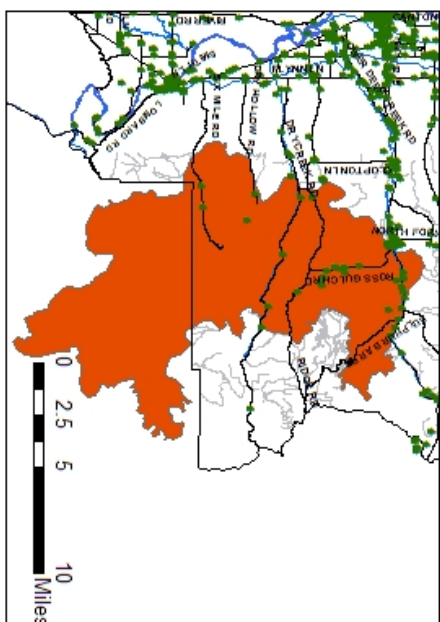
Broadwater County, MT



Bucksnot & Cave Gulch Fire Areas



Maudlow/Toston Fire Area



Data Source: Montana State Library / USDA Forest Service

WIND

Winds events, outside of severe thunderstorms or tornadoes, are common in Broadwater County. The National Weather Service issues several high wind warnings and advisories for the County several times a year. Because limited weather observing data and spotters exist in the County, the National Climatic Data Center has listed only two recent high wind events, specific to Broadwater County, on its website. Strong wind events are fairly common in Broadwater County, so this database was not relied on for historical events.

Based on the American Society of Civil Engineers publication ASCE 7-98, Broadwater County falls within Design Wind Speed Zone II (160 mph). When conditions are right for strong winds, improperly designed structures, utilities, and trees can be threatened. Without any data to support otherwise, the risk is assumed to be the same Countywide.

Wind Vulnerability

Strong winds above 20-30 mph are common in Broadwater County as fronts pass through or a strong pressure gradient develops in the upper atmosphere. These events may bring down small branches and blow debris around. The larger events with gusts over 50 mph have a greater potential to bring down power lines or damage structures. An extreme wind event may cause damages to several structures and cause blackouts, however, historically, Broadwater County has not had many of these events in which widespread damage has been found.

The mitigation planning committee believes a disastrous event resulting from a windstorm has a **moderate probability** occurring and would have a **moderate magnitude** or impact on the community. This hazard has been ranked as #11 out of 19 hazards for mitigation.

WINTER STORMS & COLD SPELLS

Snow storms and bitterly cold temperatures are common occurrences in Broadwater County and generally do not cause any problems as residents are used to winter weather and are prepared to deal with it. Sometimes, however, blizzards can occur and overwhelm the ability to keep roads passable. Heavy snow and ice events also have the potential to bring down power lines and trees. Extreme wind chill temperatures may harm residents if unprotected outdoors or if heating mechanisms are disrupted. Based on data from the Western Regional Climate Center for two stations in Broadwater County - Townsend from 1948-2002 and one mile west of Toston from 1957-1982 - temperatures have reached -40 degrees Fahrenheit, storms have produced up to 14 inches of snow in 24 hours, and snow depths have gotten up to 19 inches. Those figures could be even more severe if weather records in Broadwater County dated back further.

During the winters of 1995 and 2002, roads were closed to all but emergency traffic due to hazardous road conditions from snow. Areas Countywide can be affected by heavy snow and cold spells. The frequency of such events is hard to determine because of sporadic weather observations and historical events determined solely by residents' memories.

Winter Storm & Cold Spells Vulnerability

Winter weather in Montana is common. Snow generally does not cause the communities to shut down or disrupt activities. Occasionally, though, extreme winter weather conditions can cause problems. The most common incident in these conditions are motor vehicle accidents due to poor road conditions. Such incidents normally involve passenger vehicles, however, an incident involving a commercial vehicle transporting hazardous materials or a vulnerable population such as a school bus is also possible.

An additional vulnerability to the population is the potential for utility failure during a cold spell. In the event power or other utilities were disrupted, many homes could be without heat. With temperatures frequently dropping below zero in a typical winter, an event where heating systems failed could send many residents to shelters for protection. Other residents may try to heat their homes through alternative measures and increase the chance for structure fires or carbon monoxide poisoning. For all of these reasons, although the threat to structures is relatively low, the threat to the population can be considered moderate.

The mitigation planning committee has given the probability of a disastrous event from this hazard a **moderate probability** of occurring and a potential **moderate magnitude** or severity. This hazard is ranked #6 out of 19 hazards identified for mitigation.

Summary:

This risk assessment represents an approximate history and estimated vulnerabilities to the community from the hazards identified. As with any assessment involving natural or man-made hazards, all potential events may not be represented here and an actual incident may occur in a vastly different way than described. This assessment, however, will be used to try to minimize damages from these events in the future.

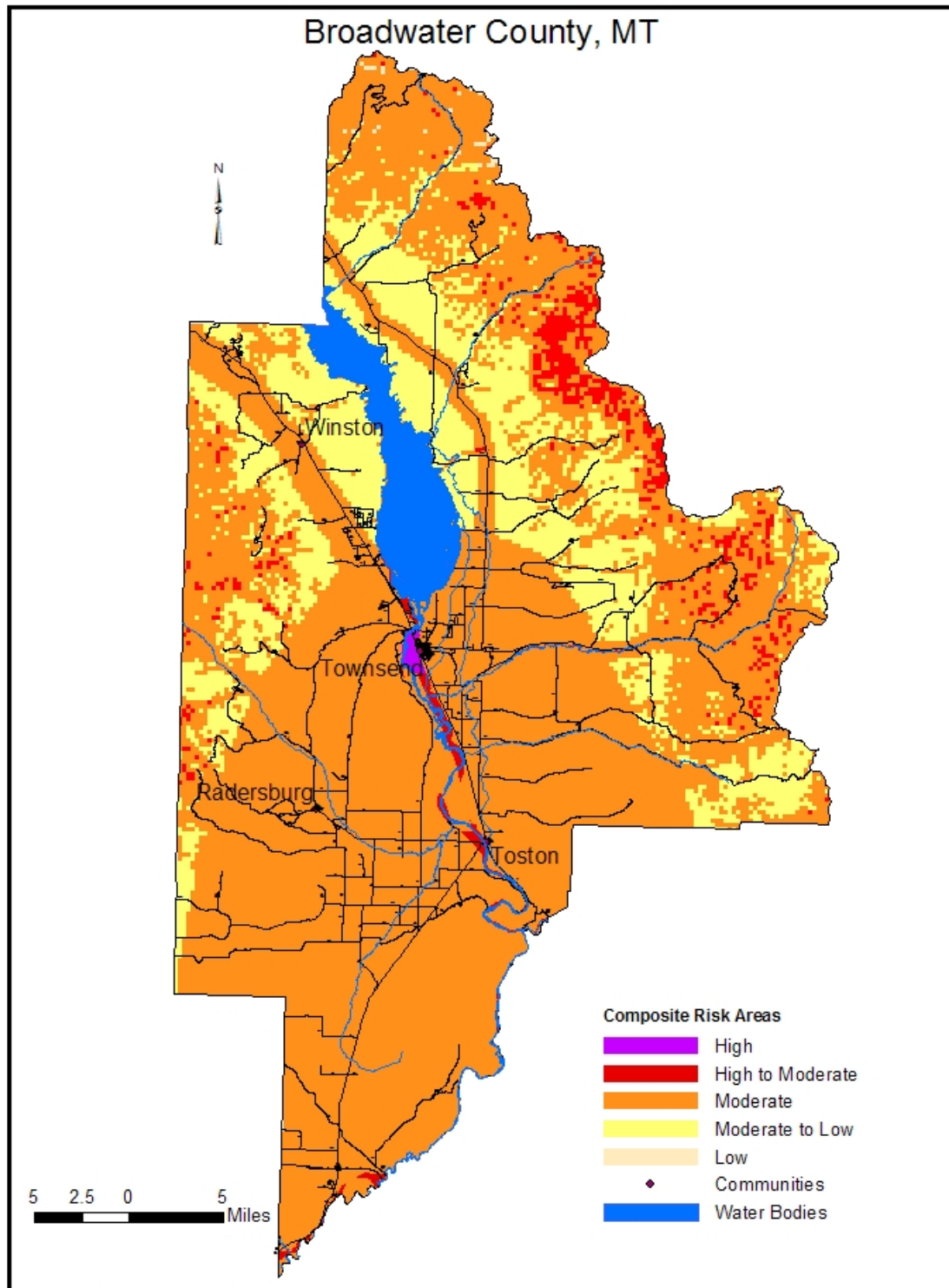
Every type of event is different ranging from population to property impacts. Incidents also have different probabilities and magnitudes even within hazards. For example, a small earthquake will be different from a large earthquake and a moderate flood will be different from both of those. In an attempt to rate hazards and prioritize mitigation activities, a summary of the impacts from an event are presented in Table 5-17. Some hazards have estimates of dollar losses and population impacted whereas others are more qualitatively assessed based on available information from the risk assessment process. For more information on these determinations, see the individual hazard profiles.

Table 5-17

Summary of Potential Impacts from Hazards					
Hazard	Probability of Disastrous Event (chance in any given year)	Property Impact	Population Impact	Economic Impact	Priority Rank
Hazardous Materials	Moderate	\$15M	High	High	1
Wildfire	Moderate-High	\$3.5M	Moderate	Moderate	2
Earthquake	Moderate	\$50M	50-100	High	3
Structure Fires	Moderate	Moderate	Moderate	Low	4
Flooding – Ice Jams	Moderate	\$1.5M	Moderate	Moderate	5
Winter Storms & Cold Spells	Moderate	Low	Moderate	Moderate	6
Tornadoes & Severe Thunderstorms	Moderate	\$350,000	Moderate	Low	7
Drought	Moderate	Low	Low	High	8
Flooding – Riverine and Flash	Low	\$1.8M	Moderate	Moderate	9
Flooding – Dam Failure	Low	\$30M	Moderate	Moderate	10
Wind	Moderate	Moderate	Moderate	Low	11
Disease	Low	Low	Moderate	High	12
Recreational Hazards	Low	Low	Low	Moderate	13
Terrorism	Low	Low	Moderate	Moderate	14
Isolation	Low	Low	Low	Low	15
Aviation	Low	\$400,000	50-100	Low	16
Landslide	Low	Low	Low	Low	17
Avalanche	Low	Low	Low	Low	18
Volcano	Low	Moderate	Low	Low	19

A composite map of the degree of risk throughout the County can be found on Map 5-47. With each of the hazard's data portraying different information and level of risk, this map is quite limited in the information it provides. As a requirement of this plan, however, the composite map is included. Very generally, the categories can be broken down as follows. The high hazard areas are the locations that are within the radius of a fixed hazardous material facility, in the floodplain, and in the highest earthquake zone. This area is located primarily to the west and north of Townsend. The high to moderate areas are the areas that are within the radius of a hazardous material transportation route, in the floodplain, and in the highest earthquake zone or are in a moderate crown fire potential area. The moderate areas are the remaining high earthquake risk areas, hazardous materials transportation route buffer zones, and low crown fire potential areas. The low to moderate areas are the remaining moderate earthquake potential zone sections. The low areas are the sections not included in all of the previous categories. More useful information can be derived by evaluating the risk on an individual hazard basis.

Composite Hazard Map



Data Source: Individual Hazard Profiles

Mitigation Strategy

The mitigation strategy is the course of action Broadwater County and the City of Townsend hope to take to prevent losses from disasters in the future. Rather than wait until a disaster occurs, these communities have developed this strategy to move in a proactive direction in disaster prevention. All losses cannot be entirely mitigated, however, some actions can be taken, as funding and opportunities become available, that may reduce the impacts of disasters and eventually save taxpayers money. The mitigation strategies were developed based on direct input from the communities and prioritized through a multi-step process.

Attendees of the June 19, 2003 public meeting were individually polled on the probability of a disastrous event occurring from each hazard, the magnitude or impact of that event to the community, and the ranking of each hazard for mitigation. The results are as follows in Table 6-1.

Table 6-1

Priority Ranking Survey Results for Broadwater County			
Hazard	Probability of Disastrous Event (chance in any given year)	Magnitude (severity/impact to community)	Priority Rank
Hazardous Materials	Moderate	High	1
Wildfire	Moderate-High	High	2
Earthquake	Moderate	Moderate-High	3
Structure Fires	Moderate	Moderate	4
Flooding – Ice Jams	Moderate	Moderate	5
Winter Storms & Cold Spells	Moderate	Moderate	6
Tornadoes & Severe Thunderstorms	Moderate	Moderate	7
Drought	Moderate	Moderate	8
Flooding – Riverine and Flash	Low	Low	9
Flooding – Dam Failure	Low	Moderate	10
Wind	Moderate	Moderate	11
Disease	Low	Moderate	12
Recreational Hazards	Low	Low	13
Terrorism	Low	Low	14
Isolation	Low	Low	15
Aviation	Low	Low	16
Landslide	Low	Low	17
Avalanche	Low	Low	18
Volcano	Low	Low	19

Based on these prioritizations, goals and objectives were developed. Meeting participants then came up with suggested actions to be taken for those goals. Additional actions were also developed based on

recommendations in existing community policies, plans, and studies. The goals, objectives, and many of the suggested actions are listed in the following section.

Goals, Objectives, and Proposed Actions

Goal 1: Reduce the community's risk of exposure to hazardous materials.

Objective 1.1: Protect and secure the propane tanks along the railroad tracks in Townsend.

- Explore the option of burying the propane tanks.
- Secure the propane tanks with barriers from vehicles and trains.
- Formally request Montana Rail Link slow trains in the Townsend area.
- Put in derailment guards/protection.
- Remove surface propane tanks and replace with underground natural gas lines.

Objective 1.2: Identify specific factors (intersections, railroad crossings, vulnerable populations, critical facilities, speed limits) in the County that are important to hazardous materials incidents and the associated response.

- Research and submit specific area information to regional HazMat teams that could assist them in mitigating impacts to the population in Broadwater County, an area not very familiar to them, during a hazardous material response.

Goal 2: Reduce the community's risk of large-scale structure and wildland fires.

Objective 2.1: Minimize exposure within wildland/urban interface and other high fire hazard areas for new development and existing structures.

- Encourage current landowners to reduce fuels in wildland interface and around homes through a financial incentive program.
- Educate the public, especially those at high risk from wildland/urban interface fires.
- Consider all land uses in areas at risk from wildland/urban interface fires and restrict or prohibit land uses as necessary to assure the public health, safety, and welfare of the citizens of Broadwater County.
- Revise subdivision regulations to reduce wildfire and structure fire hazards such as requiring a water supply, sprinklers, and/or defensible space. (See Broadwater County Rural Fire District's Community Fire Plan for more specific details on requirement alternatives.)
- Coordinate activities of individual landowners, rural fire departments, other fire departments, and the Forest Service to provide for cooperation before, during, and after a fire incident.

Objective 2.2: Reduce the fire potential in forested areas, particularly near the urban-wildland interface.

- Encourage and support USFS initiative for landscape level burning and fuel mitigation projects.
- Encourage private and public landowners to manage their forests to preserve the natural processes by developing and maintaining a diversity of species, ages, and stand densities that serve as a natural deterrent to fire outbreaks.

Goal 3: Reduce potential structural damage from earthquakes.

Objective 3.1: Identify community structures susceptible to major damage from earthquakes.

- Survey local structures and provide information to emergency services (similar to old Sanborn maps).
- Study the potential for retrofitting critical facilities, such as the school, for earthquake resistance.
- Develop better HAZUS GIS data through a cooperative program with the school GIS/GPS classes.

Objective 3.2: Make public facilities safer and stronger during an earthquake.

- Strongly adhere to State codes for public buildings that require some earthquake protection.
- Retrofit existing public buildings for earthquake safety.
- Educate public works employees on earthquake damage prevention measures.

Objective 3.3: Reduce injuries in private buildings and homes from falling debris.

- Educate the local population about earthquakes and their effects on individuals, homes, businesses, and public works.
- Enact regulations for more earthquake resistant building codes.
- Provide regular prevention/educational items to the local media.
- Develop on-site education programs for schools, churches, and businesses.

Goal 4: Reduce the impact of weather related hazards.

Objective 4.1: Improve hazard warning systems in the community.

- Implement a system of notifying the community of the severity of storms, particularly winter storms, through public information.
- Develop an early warning system such as sirens or NOAA weather radios.
- Provide public information on actions that will be taken by emergency services during weather events.
- Explore possibility of implementing a Reverse 911 system.
- Implement, in cooperation with the National Weather Service, a flood warning system for Townsend including an automated phone system to authorities, a three gauge system with one gauge in Toston, and two near Townsend.

Objective 4.2: Identify flood patterns caused by ice jams and spring runoffs.

- Disseminate flood hazard mapping to first responders and homeowners.
- Educate the public on flood mitigation options.
- Explore runoff problems and solutions on Muddy Lane

Objective 4.3: Reduce damages from ice jamming flooding.

- Evaluate the Montana Ditch crossing to ensure that the Missouri River cannot flood the City of Townsend, as occurred in 1963.
- Place two 72-inch by 72-inch slide gates on the Irish Ditch where it crosses under the railroad tracks to prevent Missouri River ice jam water from backing into the City of Townsend. (See USACE ice jam study for more details.)

Objective 4.4: Establish a greater safety level for student travel.

- Develop and adopt a school policy regarding the use of buses in severe weather.
- Educate school/bus personnel about weather decision making parameters.

Objective 4.5: Minimize impacts from drought.

- Support the local drought advisory committee, as conditions dictate, to advise local officials on emergency actions needed and to coordinate with the State Drought Committee.

Goal 5: Increase awareness of diseases that could affect the community.

Objective 5.1: Educate the public on diseases.

- Develop a public education program on specific diseases through the public health department.

Objective 5.2: Build better relationships with neighboring counties' health departments.

- Work with neighboring counties for a "public health mutual aid" policy.

Goal 6: Reduce risk from recreational hazards, such as boating and swimming recreation.

Objective 6.1: Improve warning signs at local recreational areas.

- Increase the number of signs at campgrounds and boat launches that show statistics of injuries and deaths due to recreational activities.

Objective 6.2: Improve water safety.

- Educate public about rapidly changing weather on Canyon Ferry Lake and the associated dangers related to the weather changes.
- Provide community outreach sessions (such as first aid, water safety).

Objective 6.3: Improve community's ability to patrol and respond.

- Support enforcement of existing laws such as life jacket requirements and boating while under the influence of alcohol.

Goal 7: Utilize activities that encourage mitigation for all-hazards.

Objective 7.1: Encourage individual responsibility for preventing disasters.

- Educate the public on standard homeowner's insurance with emphasis on exclusions such as flooding and sometimes earthquakes and recent industry changes requiring wildfire defensible space in some areas.
- Promote street signs and numbers throughout the County, possibly in cooperation with 4-H.

As a first step in the prioritization process, the community ranked the hazards to ensure that mitigation activities were not only targeting priorities but also targeted the hazards the community is most concerned with. To make sure this and other factors are taken into account when prioritizing projects, a prioritization model that uses the following factors has been developed: cost (including management

costs), feasibility (politically, socially, and environmentally), population benefit, property benefit, and community priorities.

Each of the factors was ranked low, moderate, or high for each of the projects. The methods used to assign a category and the score assigned can be defined as follows:

Cost (including management):	3 Score	Low < \$10,000
	2 Score	Moderate \$10,000-\$50,000
	1 Score	High >\$50,000
Feasibility: (politically, socially, environmentally)	1 Score	Low
	2 Score	Moderate
	3 Score	High
Population Benefit:	1 Score	Low < 25% of population to benefit
	2 Score	Moderate 25%-75% of population to benefit
	3 Score	High > 75% of population to benefit
Property Benefit:	1 Score	Low < 25% of property to benefit
	2 Score	Moderate 25%-75% of property to benefit
	3 Score	High > 75% of property to benefit
Community Priorities:	1 Score	Low Priority 11-19 Hazards
	2 Score	Moderate Priority 4-10 Hazards
	3 Score	High Priority 1-3 Hazards

A summary of the scores for each of the proposed projects can be found in Table 6-2.

Table 6-2

Proposed Actions and Priority Scores for Broadwater County						
Goal 1: Reduce the community's risk of exposure to hazardous materials.						
<i>Project</i>	<i>Cost</i>	<i>Feasibility</i>	<i>Population Benefit</i>	<i>Property Benefit</i>	<i>Community Priorities</i>	<i>Score</i>
Burying propane tanks	High	Moderate	Moderate	Moderate	High	10
Securing the propane tanks with barriers	Moderate	Moderate	Moderate	Moderate	High	11
Slow trains	Low	Moderate	Low	Low	High	10
Derailment protection guards	Moderate	Moderate	Moderate	Moderate	High	11
Remove propane tanks/install gas lines	High	Low	Moderate	Moderate	High	9
Information for regional HazMat teams	Low	High	Low	Low	High	11

Table 6-2 (continued)

Proposed Actions and Priority Scores for Broadwater County						
Goal 2: Reduce the community's risk of large-scale structure and wildland fires.						
<i>Project</i>	<i>Cost</i>	<i>Feasibility</i>	<i>Population Benefit</i>	<i>Property Benefit</i>	<i>Community Priorities</i>	<i>Score</i>
Fuels reduction financial incentive program	Moderate	Moderate	Moderate	Moderate	High	11
Wildfire/Structure Fire public education	Low	High	Moderate	Moderate	High	13
Prohibit land uses in extreme hazard areas	Low	Moderate	Low	Low	High	10
Revise subdivision regulations	Low	Moderate	Moderate	Moderate	High	12
Coordination of activities for fire incidents	Low	Moderate	Low	Low	High	10
Support USFS initiatives	Low	Moderate	Moderate	Moderate	High	12
Private and public forest management education	Low	Moderate	Low	Low	High	10
Goal 3: Reduce potential structural damage from earthquakes.						
<i>Project</i>	<i>Cost</i>	<i>Feasibility</i>	<i>Population Benefit</i>	<i>Property Benefit</i>	<i>Community Priorities</i>	<i>Score</i>
Survey local structures for emergency services	Moderate	Moderate	Moderate	Moderate	High	11
Study retrofitting critical facilities	Moderate	High	High	Moderate	High	13
School HAZUS data collection	Moderate	High	High	High	High	14
Strongly adhere to State codes	Low	Moderate	Moderate	Moderate	High	12
Retrofit existing public buildings	Moderate	High	High	Moderate	High	13
Educate public works employees on earthquakes	Low	High	High	High	High	15
Educate local population about earthquakes	Low	High	Moderate	Moderate	High	13
Residential earthquake resistant building codes	Low	Moderate	Moderate	Moderate	High	12
Regular earthquake awareness press releases	Low	Moderate	Moderate	Moderate	High	12
On-site earthquake education programs	Low	High	Moderate	Moderate	High	13

Table 6-2 (continued)

Proposed Actions and Priority Scores for Broadwater County						
Goal 4: Reduce the impact of weather related hazards.						
<i>Project</i>	<i>Cost</i>	<i>Feasibility</i>	<i>Population Benefit</i>	<i>Property Benefit</i>	<i>Community Priorities</i>	<i>Score</i>
Community notification system	Low	Moderate	Moderate	Low	Moderate	10
Early warning system sirens	Moderate	Moderate	Moderate	Low	Moderate	9
NOAA weather radio promotion	Moderate	High	Moderate	Low	Moderate	10
Public information on emergency services	Low	High	Moderate	Low	Moderate	11
Reverse 911 system	Moderate	Moderate	High	Low	Moderate	10
Flood warning system	Moderate	High	Moderate	Low	Moderate	10
Flood hazard mapping	Moderate	High	Moderate	Moderate	Moderate	11
Flood mitigation education	Low	High	Moderate	Moderate	Moderate	12
Muddy Lane flood study	Low	High	Low	Low	Moderate	10
Montana Ditch ice jam evaluation	Low	High	Moderate	Moderate	Moderate	12
Irish Ditch slide gates	Moderate	Moderate	Moderate	Moderate	Moderate	10
School bus weather policy	Low	High	High	Low	Moderate	12
School/bus personnel weather education	Low	High	High	Low	Moderate	12
Drought Advisory Committee	Low	High	High	Moderate	Moderate	13
Goal 5: Increase awareness of diseases that could affect the community.						
<i>Project</i>	<i>Cost</i>	<i>Feasibility</i>	<i>Population Benefit</i>	<i>Property Benefit</i>	<i>Community Priorities</i>	<i>Score</i>
Disease education program	Low	High	Moderate	Low	Low	10
Public health mutual aid policy	Low	Moderate	High	Low	Low	10

Table 6-2 (continued)

Proposed Actions and Priority Scores for Broadwater County						
Goal 6: Reduce risk from recreational hazards, such as boating and swimming recreation.						
<i>Project</i>	<i>Cost</i>	<i>Feasibility</i>	<i>Population Benefit</i>	<i>Property Benefit</i>	<i>Community Priorities</i>	<i>Score</i>
Signs at campgrounds and boat launches	Moderate	Moderate	Moderate	Low	Low	8
Canyon Ferry Lake weather education	Low	Moderate	Low	Low	Low	8
Community first aid/water safety outreach sessions	Low	High	Moderate	Low	Low	10
Water safety law enforcement	Moderate	Moderate	Moderate	Low	Low	8
Goal 7: Utilize activities that encourage mitigation for all-hazards.						
<i>Project</i>	<i>Cost</i>	<i>Feasibility</i>	<i>Population Benefit</i>	<i>Property Benefit</i>	<i>Community Priorities</i>	<i>Score</i>
Homeowner's insurance education	Low	High	Moderate	Moderate	High	13
Street signs and numbers	Moderate	Moderate	Moderate	Moderate	High	11

Implementation Plan

Those actions that have received the highest scores will be given the highest priority. As funding or opportunities to initiate these projects come up, the higher priority activities can be prioritized even further with more detailed costs, benefits, and other criteria. In addition, although, Broadwater County and the City of Townsend work together, some activities are targeted to one jurisdiction. The implementation strategy for some of the higher priority actions can be found in Table 6-3. Note that some of the activities that could be best accomplished together were combined under the higher priority item and other excluded activities represent alternatives to the higher priority items.

The projects represented in Table 6-3 list those projects that ranked highest in the priority ranking model. Other projects not listed may also be considered if they are the best fit for a specific funding source or other planning initiatives.

Table 6-3

Implementation Plan for Actions in Broadwater County				
Project Description	Jurisdiction	Responsible Agency	Potential Funding Source(s)	Priority Score
Educate public works/road & bridge employees on earthquake damage prevention measures for community infrastructure.	Broadwater County Townsend	Public Works Road & Bridge Dept. DES	Internal DOT	15
Develop better HAZUS GIS data through a cooperative program with the high school GIS/GPS classes.	Broadwater County Townsend	Townsend School Dist. Planning Dept.	Internal FEMA MT DES	14

Table 6-3 (continued)

Implementation Plan for Actions in Broadwater County				
Project Description	Jurisdiction	Responsible Agency	Potential Funding Source(s)	Priority Score
Public education program targeting those at high risk from wildland/urban interface fires demonstrating mitigation techniques.	Broadwater County	DES BCRFD	FEMA Firewise USFS MT DNRC	13
Study the potential for retrofitting critical facilities, such as the school, for earthquake resistance, and if feasible, retrofit those facilities.	Broadwater County Townsend	DES Townsend School Dist.	Internal FEMA MBMG	13
Public education program on earthquakes that teaches the residents the latest hazard information and simple home retrofits to be conducted at schools, churches, businesses, and other gathering places.	Broadwater County Townsend	DES	Internal FEMA USGS MBMG ARC	13
Support the Broadwater County Drought Advisory Committee.	Broadwater County	County Commissioners	Internal	13
Public education program on standard homeowner's insurance with emphasis on exclusions such as flooding and sometimes earthquakes and recent industry changes requiring wildfire defensible space in some areas.	Broadwater County Townsend	DES Local insurance agents	Internal Insurance agencies FEMA	13
Revise subdivision regulations to reduce wildfire and structure fire hazards such as requiring a water supply, sprinklers, and/or defensible space. (See Broadwater County Rural Fire District's Community Fire Plan for more specific details on requirement alternatives.)	Broadwater County	County Commissioners BCRFD	Internal	12
Encourage and support USFS initiative for landscape level burning and fuel mitigation projects.	Broadwater County	County Commissioners BCRFD	Internal	12
Strongly adhere to State codes for public buildings and develop residential building codes to meet earthquake resistance standards.	Broadwater County Townsend	County Commissioners Townsend City Council	Internal	12
Provide regular earthquake prevention/educational items to the local media.	Broadwater County Townsend	DES	Internal	12
Public education program targeting homes in or near the floodplain, ice jam, or dam failure inundation areas on flood mitigation options	Broadwater County Townsend	DES Planning Dept.	Internal FEMA MT DNRC USACE	12
Evaluate the Montana Ditch crossing to ensure that the Missouri River cannot flood the City, as occurred in 1963.	Townsend	DES	FEMA USACE MT DNRC	12
Develop and adopt a school policy regarding the use of buses in severe weather and educate school officials and bus drivers about weather decision making parameters.	Broadwater County	Townsend School Dist.	Internal	12

Table 6-3 (continued)

Implementation Plan for Actions in Broadwater County				
Project Description	Jurisdiction	Responsible Agency	Potential Funding Source(s)	Priority Score
Secure the propane tanks with barriers from vehicles and trains and derailment guards to the railroad tracks.	Townsend	LEPC DES	FEMA EPA Northwestern Energy Montana Rail Link	11
Research and publish specific area information for regional HazMat teams that could assist them in mitigating impacts to the population in Broadwater County, an area not very familiar to them, during a hazardous material response.	Broadwater County Townsend	LEPC BCRFD Townsend Fire	Internal EPA DOT FEMA	11
Encourage current landowners to reduce fuels in wildland interface and around homes through a financial incentive program.	Broadwater County	DES BCRFD	FEMA USFS Firewise MT DNRC	11
Survey local structures and provide information to emergency services (similar to old Sanborn maps).	Broadwater County Townsend	DES BCRFD Townsend Fire Law Enforcement	Internal	11
Public information campaign on actions that will be taken by emergency services during weather events.	Broadwater County Townsend	DES BCRFD Townsend Fire Law Enforcement	Internal	11
Disseminate flood hazard mapping to first responders and homeowners.	Broadwater County Townsend	DES Planning Dept.	Internal FEMA MT DNRC	11
Promote street signs and numbers throughout the County, possibly in cooperation with 4-H.	Broadwater County Townsend	BCRFD Townsend Fire Law Enforcement Road & Bridge Dept.	Internal 4-H	11

The enabling legislation for the implementation of this plan specifically comes from Section 322, Mitigation Planning, of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, enacted by Section 104 of the Disaster Mitigation Act of 2000 (P.L. 106-390). The Interim Final Rule for this legislation was published in the Federal Register on February 26, 2002 at 44 CFR Part 201. Other legislation, orders, and plans that support the initiatives presented in this plan include:

- Presidential Executive Order 12898, Environmental Justice
- Presidential Executive Order 11988, Floodplain Management
- Presidential Executive Order 11990, Protection of Wetlands
- Montana Code Annotated, Title 10, Chapter 3, Disaster and Emergency Services
- Montana Code Annotated, Title 76, Chapter 3, Montana Subdivision and Platting Act
- Montana Code Annotated, Title 76, Chapter 4, Montana Sanitation in Subdivisions Act
- Montana Code Annotated, Title 76, Chapter 5, Flood Plain and Floodway Management
- Montana Code Annotated, Title 50, Chapter 60, Building Construction Standards
- Broadwater County Resolution, December 18, 1975, Natural Streambed and Land Preservation Act Implementation
- Broadwater County Resolution, June 2, 1981, Floodplain Management
- Broadwater County Resolution, June 6, 1985, City and County Disaster and Emergency Services

- Broadwater County Growth Policy Plan and Comprehensive Economic Development Strategy, May 2003
- Broadwater County Rural Fire District's Community Fire Plan, October 2003

The approval of this plan shows that hazard mitigation is an important priority in Broadwater County and the City of Townsend. As a priority, the information contained in this plan will be used in current and future planning initiatives. Broadwater County currently uses a subdivision review process when making decisions for residential development. The County planners and commissioners will incorporate the mitigation goals and objectives contained here into their subdivision review process. Using the hazard information and mitigation goals outlined here when making decisions regarding future development concurs with the recommendations in the County Growth Policy Plan for growth outside the floodplain and high fire risk areas. The growth plan also mentions that a five to six year capital improvement plan should be developed by the County. Once such a plan is developed, the plan will also work toward the mitigation goals established here.

Plan Maintenance Procedures

This plan is maintained for Broadwater County and the City of Townsend by the Broadwater County LEPC. This committee has representatives from both jurisdictions and was active in the development of this plan. Annually at the January LEPC meeting, typically held on the third Thursday of the month at 5:10PM at the Townsend Fire Hall, a public meeting will be held to review the plan. Notices will be posted in The Townsend Star newspaper and press releases will be sent to the local media. Needed changes should be made and committee approval may then take place at the January or subsequent meetings. As hazard information is added or updated, events occur, and projects are completed, the plan will need to be updated. Each year, a notice of approval will be sent to Montana Disaster & Emergency Services by the Broadwater County DES Coordinator, and if major changes take place, a revised version of the plan will also be submitted. Every five years, the plan will be submitted to Montana Disaster & Emergency Services and the Federal Emergency Management Agency Regional Office for their approval. The next formal submission will occur in January 2009.

An important aspect of this plan since its inception has been public involvement. To encourage continued participation, comments can be directed to the Broadwater County DES Coordinator. This office can be reached at:

Broadwater County Disaster & Emergency Services
Broadwater County Courthouse
515 Broadway
Townsend, MT 59644
406-266-9250

Comments will be considered during the annual review of this plan. The public is also encouraged to attend the plan review meeting. If needed, a special LEPC subcommittee will be developed to hold meetings and coordinate plan changes and comments.

Appendix A

Meeting Notes

Discussion on All-Hazard Mitigation Team with LEPC on 3/20/03

Attendees: Duane Halverson - Landowner, Ted Lawrence – Townsend Fire Chief, Ed Shindoll – BC Fire Chief, Jim Holland Jr. – LDS Church, Leslie Heisey – BC Fire Board Chair, Brian Patrick – Townsend School Superintendent, Mary Alice Upton – Townsend Mayor, Buffy Woodring – Red Cross, Larry Woodring – School Bus Contractor, Linda Campbell – County Health Nurse, Elaine Mann – County Commissioner, Jim Langsather – DES Coordinator, Pam Pedersen – Big Sky Hazard Management

Who should be on the team?

- Elected Officials
- Church Groups
- School Administration
- Fire Service
- Law Enforcement – although, may be difficult
- Business – through Chamber of Commerce?
- Rep. Rehberg's Aid
- Health Board – Dr. Campbell

How should we advertise the meeting? What will get folks interested?

- Bring food (preferably donuts ☺)
- Article/Notice in The Star
- Poster at Bob's, Post Office, Library, Wheat Montana, Winston Store

How knowledgeable are the public and the officials about the hazards? Have there been any disasters that really stick out for people around here?

- Wildfires of 1988 & 2000
- Ice Jam of 1998 (History – Kathy Brown or Melissa)
- Earthquake of 1959 (Fault Lines – Kathy Brown or Melissa)
- "Little Tremors" 2 years ago
- Concerns:
- Gas Line
- Railroad
- Transportation Hazards
- Oil Line
- Isolation due to loss of two bridges
- Flash Floods
- Dam Failures
- Ditch Flooding in SE corner of town
- Silos – no fire protection water

When and where should we have our meetings?

- After LEPC meetings at 5:30PM
- School Community Room
- Courthouse – Basement or Courtroom
- Fire Hall in Toston

First impressions – how successful/useful do you think this process will be?

- World events will help
- LEPC is a positive group
- Doubtful about public – emphasize attending only one meeting to make an impact
- Generic poster with meeting dates to be changed and specific communities targeted
- Use county website

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All-Hazard Mitigation Team Public Meeting – 4/17/03

Attendees: Duane Halverson – Landowner
Ed Shindoll – Broadwater County Rural Fire District Chief
Leslie Heisey – Broadwater County Rural Fire District Board Chair
Linda Campbell – Broadwater County Health Nurse
Walter Leedle – Broadwater County Rural Fire District Asst Chief
Melissa Tuemmler – Broadwater County Sanitarian/911 Coordinator
Jenny Schaubert – Broadwater County Planning Board/Red Cross
Mary Mistek – Broadwater Health Center EMS
Dewey Arnold – US Forest Service Fire Management Officer
Jim Holland Jr. – LDS Church
Ted Lawrence – Townsend Fire Chief
Jerry Williams – Townsend Fire
Elaine Mann – Broadwater County Commissioner
Jim Langsather – Broadwater County Disaster & Emergency Services
Pam Pedersen – Big Sky Hazard Management
Unidentified Person who showed up late

1. A description of the Hazard Mitigation Plan was briefly given to the audience by Big Sky Hazard Management. Handouts from the March LEPC were updated and distributed.
2. Introductions were given.
3. Hazards Identification – Hazards were identified individually by attendees on sticky note cards. Participants were instructed to list the hazard on the front and any historical significance or solutions on the back. The cards were then reviewed and grouped into categories. The following are the contents of the cards and their categories:

Roads

- Weather, Roads closed as a result –

Fire

- Structure Fires in Developments, No water for firefighting – Place water resources and firefighting assets in the area around developing areas
- Wildland Fires – Yes, every couple of years

Flooding

- Ice Jam at North Bridge of Highway 287 -
- Ice Jam, Townsend Bridge – Study, FEMA
- Flooding that causes Road Washouts – This Spring along US 12/287 plus rural roads, Solutions, Proper Culverts and Road Maintenance

Hazardous Materials

- 3 Propane Plants, 1 Tank Gas, Near Railroad Tracks, Townsend on Front Street – Train wreck possible, Vehicle wreck into tank
- Chemical Storage – Lists from businesses where sold
- Rupture of Interstate Fuel Pipeline – Solution: ?

- Transportation of Hazardous Materials on highway and railroad –

Terrorism

- Bomb Scare or a Sniper -

Earthquake

- Earthquakes, Time for a Big One = Propane Hazard –

Disease

- Animal & Livestock Disease – Hasn't Happened
- Influenza pandemic –

Water Safety

- Canyon Ferry Lake, drowning hazard – better patrolling, public education

Attendees also stuck identifiers on a Broadwater County map showing where they believe is the area most at risk. The corridor along Highway 287 was the most identified area with a concentration near Townsend.

4. The topics for future meetings were reviewed:

April 17 – Hazard Identification

May 15 – Risk Assessment

June 19 – Mitigation Strategies

July 17 – Action Plan

August 21 – Final Review, if needed

All-Hazard Mitigation Team Public Meeting – 5/15/03

Attendees: Duane Halverson – Landowner
Ed Shindoll – Broadwater County Rural Fire District
Leslie Heisey – Broadwater County Rural Fire District
Brian Patrick – Townsend K-12 School District #1
Mary Alice Upton – Townsend Mayor
Linda Campbell – Broadwater County Health
Walter Leedle – Broadwater County Rural Fire District
Richard Thompson – Broadwater County Sheriff
Melissa Tuemmler – Broadwater County Sanitarian/911 Coordinator
Jenny Schaubert – Broadwater County Planning Board/Red Cross
Mary Mistik – Broadwater County EMS
Elaine Mann – Broadwater County Commissioner
Jim Langsather – Broadwater County Disaster & Emergency Services
Pam Pedersen – Big Sky Hazard Management

The hazards identified and data collected from previous meetings and Big Sky Hazard Management researched were reviewed in alphabetical order. The following areas were reviewed from a draft document for each hazard: how and why identified, data limitations, maps, history, probability and magnitude, and areas affected.

Below were the comments made:

Avalanche – Avalanches have occurred on Baldy Peak and in Edith Basin and are primarily a threat to snowmobilers.

Aviation – The airport is also owned by the county. They serve approximately 13 flights per day. The military, specifically the Montana National Guard, conduct helicopter training from the airport. Minor accidents have occurred, possibly twice. Discussion followed regarding any fatalities. No consensus was reached.

Disease – A request was made to add rabies and scabies to the list of livestock and animal diseases. The influenza pandemic after World War I was brought up as a past event.

Drought – The conservation district was mentioned as a possible resource.

Earthquake – No comments

Flooding – Dam Failure – The county has eight emergency plans currently.

Flooding – Ice Jams – No comments

Flooding – Riverine and Flash – The January 1997 event was brought up when the roads to the lagoon were flooded.

Hazardous Materials – Seventeen to twenty-one trains pass by the propane tanks each day.

Isolation – The North bridge was built in the early 1980's and the South one in the late 1950's.

Landslide – No comments

Structure Fires – Change the hazard area to North section of county rather than Northwest. The Silos area was specifically mentioned as a hazard area. A discussion followed regarding whether or not this hazard should stay in the plan. The consensus was to keep it in since it probably won't rank high as a priority.

Terrorism – No comments

Tornadoes & Severe Thunderstorms – No comments

Volcano – ¼ of an inch fell after St. Helens. A comment was made questioning if this hazard should be in the plan. No other discussion continued.

Wildfire – The 1988 Spring Creek fire was mentioned. The Toston-Maudlow fire destroyed a trailer and a garage. Hundreds of thousands of dollars in fences were lost. Better figures can probably be found from the Forest Service. Mr. Halverson lost \$100,000 in trees.

Windstorm – No comments

Winter Storms – 1995 and March of 2002 were mentioned as significant event occurrences when the roads were closed to non-emergency traffic.

Other Comments:

Add Recreational Hazards to the list because of the threat Canyon Ferry Lake poses.

All-Hazard Mitigation Team Public Meeting – 6/19/03

Attendees: Duane Halverson – Landowner
Mary Alice Upton – Townsend Mayor
Walter Leedle – Broadwater County Rural Fire District
Jenny Schaubert – Broadwater County Planning Board/Red Cross
Mary Mistik – Broadwater County EMS
Steve Ward - Broadwater County Rural Fire District
Ted Lawrence – Townsend Fire Chief
Jim Holland Jr. – LDS Church
Elaine Mann – Broadwater County Commissioner
Jim Langsather – Broadwater County Disaster & Emergency Services
Pam Pedersen – Big Sky Hazard Management

An overview of the HAZUS runs estimating earthquake damages was distributed and discussed.

A draft of the risk and vulnerability assessment will be on the County webpage soon and will allow for e-mail comments.

Attendees were individually polled on the probability of a disastrous event from each hazard, the magnitude or impact of that event to the community, and the ranking of each hazard for mitigation. The results are as follows:

Hazard	Probability of Disastrous Event (chance in any given year)	Magnitude (severity/impact to community)	Priority Rank
Hazardous Materials	Moderate	High	1
Wildfire	Moderate-High	High	2
Earthquake	Moderate	Moderate-High	3
Structure Fires	Moderate	Moderate	4
Flooding – Ice Jams	Moderate	Moderate	5
Winter Storms & Cold Spells	Moderate	Moderate	6
Tornadoes & Severe Thunderstorms	Moderate	Moderate	7
Drought	Moderate	Moderate	8
Flooding – Riverine and Flash	Low	Low	9
Flooding – Dam Failure	Low	Moderate	10
Windstorm	Moderate	Moderate	11
Disease	Low	Moderate	12
Recreational Hazards	Low	Low	13
Terrorism	Low	Low	14
Isolation	Low	Low	15
Aviation	Low	Low	16
Landslide	Low	Low	17
Avalanche	Low	Low	18
Volcano	Low	Low	19

After listing the first three priorities from each individual, the following goals were developed.

Goal 1: Reduce the community's risk of exposure to hazardous materials.

Goal 2: Reduce the community's risk of large-scale structure and wildland fires.

Goal 3: Reduce potential structural damage from earthquakes.

Goal 4: Reduce the impact of weather related hazards.

Goal 5: Increase awareness of diseases that could affect the community.

Goal 6: Reduce risk from recreational hazards.

Although specific actions were not developed, through discussion, the following ideas were generated:

- Educate the public on the items homeowner's insurance generally doesn't cover such as flooding and earthquakes (and maybe the risk of losing it entirely without defensive space).
- Study/retrofit critical structures, such as the school, for earthquake resistance.
- Educate the public on flooding.
- Develop better HAZUS GIS data through a co-op with the school.
 - Promote street signs and numbers throughout the County (possibly a project with 4-H?).

All-Hazard Mitigation Team Public Meeting – 7/17/03

Attendees: Duane Halverson – Landowner
Mary Alice Upton – Townsend Mayor
Jenny Schaubert – Broadwater County Planning Board/Red Cross
Mary Mistik – Broadwater County EMS
Ted Lawrence – Townsend Fire Chief
Jim Holland Jr. – LDS Church
Elaine Mann – Broadwater County Commissioner
Leslie Heisey – Broadwater County Rural Fire District
Melissa Tuemmler – Broadwater County Planner/Sanitarian/911 Coordinator
Bruce Suenram – Fire Logistics, Inc.
Buffy Woodring – American Red Cross
Linda Campbell – Broadwater County Health
Ed Shindoll – Broadwater County Rural Fire District Chief
Mike Cole – US Forest Service
Dewey Arnold – US Forest Service Fire Management Officer
Jim Langsather – Broadwater County Disaster & Emergency Services
Pam Pedersen – Big Sky Hazard Management

A package showing the results of last month's hazard prioritization results and examples of mitigation activities was distributed.

Attendees listed objectives and actions/strategies for each of the goals developed in June. All results are listed below, as they were written unless in brackets, and other verbal suggestions have been added. Several of the projects were discussed by the entire group. The results will be used as input for the mitigation strategy.

Goal 1: Reduce the community's risk of exposure to hazardous materials.

Objectives:

- Protect propane tanks.
- Propane tanks and transportation.
- Protect/secure propane tank.
- Identify potential hazards (intersections, railroad crossings, speed limits) in the County that would affect potential incidences and appropriate responses.
- Reduce cost of heating homes.
- Reduce chance of massive explosions.

Actions:

- Explore the option of burying propane tanks.
- Find a way to better protect the propane tanks.
- Possible get MT Rail Link to slow the trains as they pass through town.
- Talk with railroad.
- Speed limit for trains.
- Speak to railroad to slow trains, and de-rail protection.
- Bury tanks.
- Bury tanks.

- Slow transport vehicles down.
- Slow the trains down – enforcement.
- Bury tanks or barriers.
- Survey/map potential hazards for emergency services personnel to use.
- Submit potential hazards data to area hazmat teams.
- Remove surface propane tanks and replace with underground natural gas lines.

Goal 2: Reduce the community's risk of large-scale structure and wildland fires.

Objectives:

- Reduce fuel.
- Use Bruce's suggestions. [Community Fire Plan Recommendations]
- Reduce fuels.
- Reduce fuel load in wildland interface and around homes.
- Reduce future fires.
- Reduce disease spreading to healthy timber.

Actions:

- Encourage and support FS initiative for landscape level burning.
- Encourage private landowners to support selective cutting.
- Support for Forest Service projects.
- Encourage landowners to reduce fuels.
- Fire plan incorporate with this plan.
- Support FS projects.
- Look into plans already being used in Lewis & Clark County and other places to aid people in mitigation costs.
- Also landscape level burning.
- Coordinate activities of individual landowners, rural fire departments, other fire departments, and the Forest Service to provide for cooperation before, during, and after a fire situation.
- Use Fire Plan.
- Involve a landscape level burning.
- Work for a healthy lumber industry with public cuttable timber.

Goal 3: Reduce potential structural damage from earthquakes.

Objectives:

- Make buildings, schools, etc., safer, stronger.
- Reduce injuries in private buildings and homes from falling debris.
- Educate local population about earthquakes and their effects on individuals, homes, businesses, and public works.
- Identify community structures susceptible to major damage from earthquakes and planning for mitigation/emergency services.
- State codes for public building that require some earthquake protection.

Actions:

- Study the schools to see how safe they would be in an earthquake.
- Find data that finds what is likely to have earthquake damage.

- Study structures/dams/etc to see how structurally safe they are and what would be needed to make them safer.
- Consider when renovating structures to make safer changes.
- Encourage retro-fitting existing buildings.
- Encourage demolition of building that cannot be retrofitted.
- Enact regulations for earthquake resistant buildings.
- Check buildings for stability.
- Building codes for earthquakes.
- Check dams for potential damage.
- More education/not only in October.
- Some kind of codes for buildings in the County.
- Check if schools and other public buildings are earthquake resistant.
- Collect more data through school classes to see what structures are most at risk.
- Regular prevention/educational items for local media.
- Education program for schools, churches, and businesses (on-site).
- Education program/planning help for public works.
- Survey by ? of local structures and providing information to emergency services for planning/exercises (similar to old Sanborn maps).
- Utilize high school course in GPS/GIS to help do survey.
- Code agency would inspect as building projects occur.
- Study/retrofit critical structures, such as the school, for earthquake resistance.
- Develop better HAZUS GIS data through a co-op with the school.

Goal 4: Reduce the impact of weather related hazards.

Objectives:

- Notification of community of major storms.
- Make sure unnecessary trips are not made if weather is too bad, by schools, etc.
- Improve hazard warning systems in community.
- Identify flood patterns caused by ice jams/spring runoffs.
- Ensure a greater safety level for student travel.
- Less auto glass breakage from gravel on snow covered roads.

Actions:

- Implement a way to notify the community of severity of storms, mainly winter storms.
- Develop plan for schools.
- Early warning system – sirens, Helena radio, weather alert monitors.
- Have a policy by the school regarding use of buses in severe weather which is followed and reviewed.
- Develop school policy on bussing during winter/bad weather.
- Educate school/bus personnel about weather decision making parameters.
- Media articles on actions that will be taken by emergency services according to weather event.
- Educating law enforcement personnel on how to inform public (Reverse 911).
- Mapping project and dissemination of info to EMS/homeowners.
- Make a school board decision concerning travel for recreation events.
- Advise the size of sand (gravel) allowed on county roadways.
- Educate the public on flooding.

Goal 5: Increase awareness of diseases that could affect the community.

Objectives:

- Educate public.
- Educate.
- Relation building between counties.
- Use Health Nurse.
- People should undergo a disease education awareness program.

Actions:

- Implement policy.
- Policies and grant money and work with neighboring counties for help.
- Public education on specific diseases by the public health department.
- County health nurse could use the local paper to bring the community up-to-date on potential health problems.

Goal 6: Reduce risk from recreational hazards.

Objectives:

- Show numbers of injuries and deaths due to recreational activities.
- Reduce deaths related to recreation on the water.
- Improve water safety.
- Improve community's ability to patrol and respond.
- Reduce injuries or death that could occur from boating and swimming recreation.

Actions:

- Public education programs.
- Law enforcement activities.
- Educate public about weather effects and changing weather on Canyon Ferry and danger related to weather changes.
- Enforcement of existing laws, i.e. – wearing life jackets, boating while under the influence of alcohol.
- Community outreach sessions (like how first aid is done).
- Improve warning signs at local recreational areas.
- Seek funding to expand enforcement ability and search and rescue training/equipment.
- Fish & Game would make spot checks to ensure compliance with regulations established for such activities.

Other Goals & Comments:

- Continuing public relations/media/information.
- Educate the public on the items homeowner's insurance generally doesn't cover such as flooding and earthquakes (and maybe the risk of losing it entirely without defensive space).
- Promote street signs and numbers throughout the County (possibly a project with 4-H?).

LEPC Meeting – 11/20/03

Attendees: Duane Halverson – Landowner
Mary Alice Upton – Townsend Mayor
Buffy Woodring – American Red Cross
Steve Ward – Broadwater County Rural Fire District
Ted Lawrence – Townsend Fire Chief
Jim Holland Jr. – LDS Church
Elaine Mann – Broadwater County Commissioner
Walter Leedle – Broadwater County Rural Fire District
Bill Fleiner – Contractor/Consultant
Brian Patrick – Townsend Schools Superintendent
Ed Shindoll – Broadwater County Rural Fire District Chief
Virgil Barbe – Broadwater County Search & Rescue
Jim Langsather – Broadwater County Disaster & Emergency Services
Pam Pedersen – Big Sky Hazard Management

A slide show presentation of the maps created for the risk assessment was given to the LEPC prior to the release of the draft plan. The presentation included a description of the methodology used to determine estimated losses.

Appendix B

Public Meeting Documentation



April 9, 2003

For Immediate Release

Contact: Pam Pedersen, Consultant

Big Sky Hazard Management
406-581-4512

OR

Jim Langsather, Coordinator

Broadwater County DES
406-266-9250

Broadwater County to Develop All-Hazard Mitigation Plan

Broadwater County Commissioners and the Local Emergency Planning Committee (LEPC) are trying to make the community safer. Broadwater County has received a grant from the Federal Emergency Management Agency (FEMA), now part of the Department of Homeland Security, and Montana Disaster and Emergency Services to create an All-Hazard Mitigation Plan. The plan will assess the risks facing the county and list possible measures that could be taken to make the community more disaster resistant. Mitigation can take many different forms from construction projects to public education. This plan will also allow the county to be eligible for future federal and state mitigation grants.

A contract has been awarded to Big Sky Hazard Management of Bozeman to write the plan, however, the county would like to see public involvement. "The Commissioners would like the citizens to attend at least one of these planning meetings so we don't miss any concerns or hazards that may need future mitigation," advises Elaine Mann, District 3 Commissioner, "So please pick one of the meeting dates and help us make a list."

Meeting are scheduled for 5:30PM on April 17th, May 15th, June 19th, and July 17th at the Townsend High School/County Library in the Community Room. The public is encouraged to attend. The focus for the first meeting will be hazard identification.



July 3, 2003

For Immediate Release

Contact: Pam Pedersen, Consultant

Big Sky Hazard Management
406-581-4513

OR

Jim Langsather, Coordinator

Broadwater County DES
406-266-9250

Broadwater County Prioritizes Hazards

The Broadwater County Local Emergency Planning Committee (LEPC) has prioritized the hazards facing the community for action. The county is writing a Hazard Mitigation Plan through a grant received from the Federal Emergency Management Agency and Montana Disaster and Emergency Services. Through the planning process, the following hazards have been identified and ranked based on their potential to create a local disaster:

1. Hazardous Materials
2. Wildfires
3. Earthquakes
4. Structure Fires
5. Ice Jam Flooding
6. Winter Storms & Cold Spells
7. Severe Thunderstorms & Tornadoes
8. Drought
9. Riverine and Flash Flooding
10. Dam Failure Flooding
11. Windstorm
12. Disease
13. Recreational Hazards
14. Terrorism
15. Isolation
16. Aviation Incident
17. Landslide
18. Avalanche
19. Volcanic Ash

Appendix C

Public Meeting Handout Materials

All-Hazard Mitigation Plan Information Sheet

WHAT: Broadwater County has received a grant from the Federal Emergency Management Agency (FEMA) through Montana Disaster and Emergency Services (MT DES) to create an All-Hazard Mitigation Plan. This plan generally has four parts:

1. The Planning Process
2. A Risk Assessment
3. A Mitigation Strategy
4. The Plan Implementation

The basic definition of hazard mitigation is “any sustained action taken to reduce or eliminate the long-term risk to human life and property from hazards.” Mitigation can take many different forms from construction projects to public education. Examples from other communities include creating tougher zoning regulations in hazard areas, elevating or purchasing homes in the floodplain, retrofitting buildings for seismic hazards, putting fences around drinking water supplies, community warning alert systems, enlarging culverts, and educating the public on insurance. Of course, every community is different, but the basic idea is to make your community safer and more disaster resistant.

WHY: By taking action before a disaster strikes, the impact to your community during a disaster can be minimized. More specifically, this plan (to be approved by FEMA and MT DES) is a new requirement under the Disaster Mitigation Act of 2000 in order for communities to receive Hazard Mitigation Grant Program funds and other types of disaster assistance. The plan must be in place before the disaster hits or else the community loses out on this potential funding. More importantly, though, this plan will clarify the hazards that face the community and what actions can be taken to minimize them.

WHEN and WHERE: We have until September 15, 2003 to complete this plan. The Mitigation Team will meet at least four times to ensure the public can be adequately involved and the community’s goals and needs are met.

Dates: April 17, May 15, June 19, and July 17 (maybe August 21, if needed)

Time: 5:30 PM

Location: Townsend High School/County Library in the Community Room

HOW: Mitigation Team meetings will have specific agendas, action items, and a designated time frame, however, discussion and “brainstorming” is needed. Everyone, including the public, should have an opportunity to voice their concerns and ideas. Based on the information gathered, Pam Pedersen from Big Sky Hazard Management will research and write the plan. The team will review the plan as it is written. Once completed, the plan will need to be formally adopted by Broadwater County and the City of Townsend.

Your questions, concerns, or ideas can be sent to:

Pam Pedersen
Big Sky Hazard Management
406-581-4512
pam_pedersen@yahoo.com

OR

Jim Langsather
Broadwater Co. Disaster & Emergency Services
406-266-9250

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1. Please circle what you believe the probability and magnitude of each hazard is.
2. Please prioritize the hazards for mitigation activities (1=highest priority, 19=lowest priority)

Hazard	Probability of Disastrous Event (chance in any given year)			Magnitude (severity/impact to community)			Priority Rank
Avalanche	Low	Moderate	High	Low	Moderate	High	
Aviation	Low	Moderate	High	Low	Moderate	High	
Disease	Low	Moderate	High	Low	Moderate	High	
Drought	Low	Moderate	High	Low	Moderate	High	
Earthquake	Low	Moderate	High	Low	Moderate	High	
Flooding – Dam Failure	Low	Moderate	High	Low	Moderate	High	
Flooding – Ice Jams	Low	Moderate	High	Low	Moderate	High	
Flooding – Riverine and Flash	Low	Moderate	High	Low	Moderate	High	
Hazardous Materials	Low	Moderate	High	Low	Moderate	High	
Isolation	Low	Moderate	High	Low	Moderate	High	
Landslide	Low	Moderate	High	Low	Moderate	High	
Recreational Hazards	Low	Moderate	High	Low	Moderate	High	
Structure Fires	Low	Moderate	High	Low	Moderate	High	
Terrorism	Low	Moderate	High	Low	Moderate	High	
Tornadoes & Severe Thunderstorms	Low	Moderate	High	Low	Moderate	High	
Volcano	Low	Moderate	High	Low	Moderate	High	
Wildfire	Low	Moderate	High	Low	Moderate	High	
Windstorm	Low	Moderate	High	Low	Moderate	High	
Winter Storms & Cold Spells	Low	Moderate	High	Low	Moderate	High	

Prioritization Results from the Last Meeting (June 19, 2003)

Hazard	Probability of Disastrous Event (chance in any given year)	Magnitude (severity/impact to community)	Priority Rank
Hazardous Materials	Moderate	High	1
Wildfire	Moderate-High	High	2
Earthquake	Moderate	Moderate-High	3
Structure Fires	Moderate	Moderate	4
Flooding – Ice Jams	Moderate	Moderate	5
Winter Storms & Cold Spells	Moderate	Moderate	6
Tornadoes & Severe Thunderstorms	Moderate	Moderate	7
Drought	Moderate	Moderate	8
Flooding – Riverine and Flash	Low	Low	9
Flooding – Dam Failure	Low	Moderate	10
Windstorm	Moderate	Moderate	11
Disease	Low	Moderate	12
Recreational Hazards	Low	Low	13
Terrorism	Low	Low	14
Isolation	Low	Low	15
Aviation	Low	Low	16
Landslide	Low	Low	17
Avalanche	Low	Low	18
Volcano	Low	Low	19

Developing Goals and Objectives

Based on FEMA's guidance, the goals and objectives should "guide the development and implementation of mitigation measures."

Definitions from FEMA's Plan Criteria:

Goals are general guidelines that explain what you want to achieve. They are usually long-term and represent global visions, such as "eliminate flood damage."

Objectives define strategies or implementation steps to attain the identified goals. Unlike goals, objectives are specific, measurable, and have a defined completion date. Objectives are more specific, such as "adopt a zoning ordinance prohibiting new development in the floodplain."

Examples of Goals and Objectives:

- Goal 1: Reduce economic impacts of drought.
 - Objective 1.1: Minimize damage to local crops due to drought situations.
 - Action 1.1.1: Develop water-rationing measures that will be implemented during a drought situation.
 - Timeframe: 1 year
 - Funding: No additional funding required
 - Organization: Department of Environment
 - Action 1.1.2: Educate residents on the benefits of conserving water at all times, not just during a drought.
 - Timeframe: 1 year
 - Funding: State Mitigation Fund
 - Organization: Department of Environment
 - Action 1.1.3: Work with local farmers to investigate the use of more drought-resistant crops.
 - Timeframe: Ongoing
 - Funding: No additional funding required
 - Organization: University Extension Service & Planning Department
 - Objective 2.1: Install security measures at the anhydrous ammonia transfer and storage facility.
 - Objective 2.2: Increase the level of security of the facility using landscape design, lighting, and vehicle barriers.
 - Objective 2.3: Assess feasibility of hardening product storage and handling infrastructure.

Examples of Mitigation Measures

(from *Developing the Mitigation Plan*, FEMA 386-3)

Prevention:

- Building codes
- Density controls
- Design review requirements
- Easements
- Floodplain development regulations
- Floodplain zoning
- Forest fire fuel reduction
- Hillside development regulations
- Open space preservation
- Stormwater management regulations
- Subdivision and development regulations
- Transfer of development rights

Property Protection:

- Acquisition of hazard-prone structures
- Construction of barriers around structures
- Elevation of structures
- Structural retrofits (e.g., reinforcement, floodproofing, storm shutters, bracing, etc.)

Public Education & Awareness

- Hazard information centers
- Public education and outreach programs
- Real estate disclosure

Natural Resource Protection:

- Best management practices (BMPs)
- Forest and vegetation management
- Stream corridor restoration
- Stream dumping regulations
- Urban forestry and landscape management
- Wetlands development regulations

Emergency Services

- Critical facilities protection
- Emergency response services
- Hazard threat recognition
- Hazard warning systems (community sirens, NOAA weather radio)
- Health and safety maintenance
- Post-disaster mitigation

Structural Projects

- Channel maintenance
- Dams/reservoirs
- Levees and floodwalls
- Safe room/shelter

Please write down your ideas for objectives and actions/projects to mitigate the hazards.

If possible for the actions, identify the specific area/buildings targeted, lead agency, and potential funding.

Goal 1: Reduce the community's risk of exposure to hazardous materials.

Objectives:

Actions:

Goal 2: Reduce the community's risk of large-scale structure and wildland fires.

Objectives:

Actions:

Goal 3: Reduce potential structural damage from earthquakes.

Objectives:

Actions:

Goal 4: Reduce the impact of weather related hazards.

Objectives:

Actions:

Goal 5: Increase awareness of diseases that could affect the community.

Objectives:

Actions:

Goal 6: Reduce risk from recreational hazards.

Objectives:

Actions:

Other Goals, etc...? Comments?

Appendix D

References

References

- Anderson, Larry, et al. Late Quaternary Activity of the Canyon Ferry Fault, Montana. Geological Society of America, Abstracts with Programs, vol. 35. 2003.
- Brainerd, Elizabeth and Mark V. Siegler. The Economic Effects of the 1918 Influenza Epidemic. June 2002.
- Broadwater County. Broadwater County Growth Policy Plan and Comprehensive Economic Development Strategy. May 2003.
- Broadwater County Disaster and Emergency Services. Broadwater County Emergency Operations Plan and Annexes. May 2003.
- Broadwater County Disaster and Emergency Services. A History of Ice Jam Flooding on the Missouri River Near Townsend: A Preliminary Review of the Historical Record. March 1997.
- Broadwater County Rural Fire District. Broadwater County Rural Fire District's Community Fire Plan. October 2003.
- Godt, Jonathan W. "Digital Compilation of Landslide Overview Map of the Conterminous United States" U.S. Geological Survey Open-File Report 97-289 1997.
- Montana Department of Natural Resources and Conservation, Water Resources Division, State Water Projects Bureau. Broadwater-Missouri (Toston) Dam Emergency Action Plan, FERC Project No. 2853. Originally published June 1991, Revised March 2003.
- Montana Disaster and Emergency Services Division, Department of Military Affairs. Montana Hazard/Vulnerability Analysis. 1987.
- Montana State University, Department of Earth Sciences, and the Montana Highway Department. Vulnerability to Avalanches in Montana. 1978.
- Pardee, J.T. The Montana Earthquake of June 27, 1925. U.S. Geological Survey Professional Paper, Vol. 147, p. 7-23. 1927.
- Stickney, Michael et al. Quaternary Faults and Seismicity in Western Montana. Montana Bureau of Mines and Geology Special Publication 114. 2000.
- Uniform Building Code, International Conference of Building Officials. Seismic zone map of the United States. 1991.
- US Army Corps of Engineers, Omaha District, Section 22 – Planning Assistance to States Study. Evaluation of Ice Jam Problems Along the Missouri River Near Townsend, Montana. March 2000.
- US Department of Interior, Bureau of Reclamation, Division of Irrigation, Division of Project Development cooperating, Region 6 – Billings, MT. Report on Ice Gorges and Winter Flooding near Townsend, Montana. June 1958.
- Wong, Ivan, et al at URS Greiner Woodward Clyde Federal Services through Montana Department of Natural Resources. Seismotectonic Evaluation of the Broadwater Power Project, Toston Dam, Montana. March 5, 1999.

Yellowstone Pipe Line Company. Emergency Response Plan Area 2, Manhattan to Drummond including Helena to Great Falls. October 1998.

Appendix E

Acronyms

Acronyms

ARC – American Red Cross
ASCE – American Society of Civil Engineers
BCRFD – Broadwater County Rural Fire District
DES – Disaster and Emergency Services
DNRC – Department of Natural Resources and Conservation
DOT – Department of Transportation
EOP – Emergency Operations Plan
EPA – Environmental Protection Agency
FEMA – Federal Emergency Management Agency
FHBM – Flood Hazard Boundary Map
FIRM – Flood Insurance Rate Map
GIS – Geographic Information System
ISO – Insurance Services Organization
LEPC – Local Emergency Planning Committee
MBMG – Montana Bureau of Mines and Geology
NID – National Inventory of Dams
NOAA – National Oceanic and Atmospheric Administration
NTSB – National Transportation & Safety Board
PGA – Peak Ground Acceleration
SARS – Severe Acute Respiratory Syndrome
USACE – United States Army Corps of Engineers
USDA – United States Department of Agriculture
USGS – United States Geological Survey
USFS – United States Forest Service